

# HOOGHLY ENGINEERING & TECHNOLOGY COLLEGE

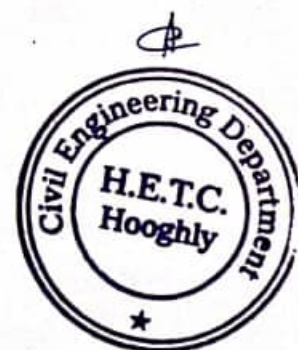
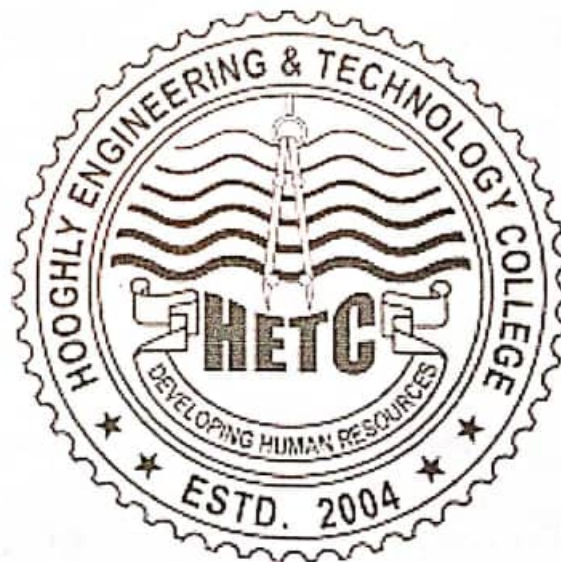
CIVIL ENGINEERING DEPARTMENT

SOIL MECHANICS LABORATORY

3<sup>RD</sup> YEAR, 5<sup>TH</sup> SEMESTER

CODE: CE(PC) 594

LABOTATORY MANUAL



## Department of Civil Engineering

Paper Name: Soil Mechanics Laboratory

Session: 2022-2023/ Year: 3<sup>rd</sup> / Semester: 5<sup>th</sup> / Paper Code: CE(PC)594

Laboratory in-Charge: Prof. Tanumoy Ghosh

Technical Assistant (s): Mr. Somnath Dey

CE(PC)594	Soil Mechanics Laboratory 2P 1 Credits
Course Outcomes	After going through this course, the students will be able to: 1. Identify different types of soil by visual inspection 2. Determine natural moisture content and specific gravity of various types of soil. 3. Estimate in-situ density by core cutter method and sand replacement method. 4. Analyze grain size distribution and Atterberg limits for soil. 5. Perform laboratory tests to determine permeability and compaction characteristics of soil. 6. Determine shear strength parameters of soil by unconfined compression test and vane shear test 7. Determine shear strength parameters of soil by direct shear test. 8. Perform triaxial test to determine shear strength parameters of soil. 9. Determine California Bearing Ratio (CBR) of soil. 10. Prepare technical laboratory report
Prerequisite	Soil Mechanics – I (CE(PC)401) and Soil Mechanics – II (CE(PC)504)
Experiment 1	Field identification of different types of soils as per Indian Standards
Experiment 2	Determination of natural moisture content.
Experiment	Determination of specific gravity of cohesionless and cohesive soils.
Experiment 4	Determination of in-situ density by core cutter method and sand replacement method.
Experiment 5	Determination of grain size distribution by sieve and hydrometer analysis.
Experiment 6	Determination of Atterberg limits (liquid limit, plastic limit and shrinkage limit).
Experiment 7	Determination of co-efficient of permeability by constant and variable head permeability tests.
Experiment 8	Determination of compaction characteristics of soil by standard proctor compaction test.
Experiment 9	Determination of unconfined compressive strength of soil by unconfined compression test.
Experiment 10	Determination of shear strength parameters of soil by direct shear test.



Experiment 11	Determination of undrained shear strength of soil by vane shear test.
Experiment 12	Determination of shear strength parameters of soil by unconsolidated undrained triaxial test.
Experiment 13	Determination of California Bearing Ratio (CBR) of soil.
Experiment 14	Determination of relative density of soil.
Experiment 15	Standard Penetration Test.
Reference	1. Soil Mechanics Laboratory Manual by Braja Mohan Das (Oxford university press). 2. SP: 36 (Part - I and Part - II)

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HOOGHLY ENGINEERING & TECHNOLOGY COLLEGE  
CIVIL ENGINEERING DEPARTMENT

SOIL MECHANICS LABORATORY  
CE(PC)594

CONTENT:

1. Field identification of different types of soil as per Indian Standards [collection of field samples and identifications without laboratory testing].
2. Determination of natural moisture content.
3. Determination of specific gravity of cohesionless soils by Density bottle.
4. Determination of specific gravity of cohesive soils by Pycnometer.
5. Determination of in-situ density by core cutter method
6. Determination of in-situ density by sand replacement method.
7. Determination of grain size distribution by sieve analysis
8. Determination of grain size distribution by hydrometer analysis.
9. Determination of Atterberg limits (liquid limit and plastic limit).
10. Determination of co-efficient of permeability by constant head permeability test.
11. Determination of co-efficient of permeability by variable head permeability test.
12. Determination of compaction characteristics of soil by standard proctor compaction test.
13. Determination of compaction characteristics of soil by modified proctor compaction test.
14. Determination of unconfined compressive strength of soil by unconfined compression test.
15. Determination of shear strength parameters of soil by direct shear test. 16. Standard Penetration Test.
17. Determination of undrained shear strength of soil by vane shear test. 18. Determination of shear strength parameters of soil by unconsolidated undrained triaxial test.
19. Determination of California Bearing Ratio (CBR) of soil.
20. Determination of consolidation characteristics of soil by Consolidation Test using Consolidometer.



# HOOGHLY ENGINEERING & TECHNOLOGY COLLEGE

VIVEKANANDA ROAD, PIPULPATI  
P.O & DIST. - HOOGHLY  
PIN - 712103

NAME: RAJAT SUBIRA CHOWDHURY.

DEPARTMENT: Civil Engineering.

UNIVERSITY ROLL NO : 17601320003.

YEAR WITH SEMESTER: 3rd Year / 5th Semester.

SUBJECT WITH CODE : Soil Mechanics Laboratory [CE(PC)594].

## INDEX

SERIAL NO.	EXPT NO.	NAME OF THE EXPERIMENT	DATE OF EXPT.	DATE OF SUB.	REMARKS
01	01.	Specific gravity of Soil by Pycnometer.	08-07-22	15-07-22	20/7/22
02	02.	Specific gravity of Soil by the Density Bottle.	15-07-22	22-07-22	
03	03.	Determination of field density and dry unit weight by Cone cutter method	15-07-22	22-07-22	22/7/22
04	04.	field density and dry unit weight determination by sand replacement method	22-07-22	05-08-22	16/8/22
05	05.	Determination of Grain size distribution by Sieving	29-07-22	05-08-22	
06	06.	Grain size Analysis by Hydrometer	05-08-22	27-08-22	21/8/22
07	07.	Determination of Atterberg limits (Liquid Limits)	27-08-22	02-09-22	13/9/22
08	08.	Determination of Atterberg limits (Plastic limit & Plasticity index).	02-09-22	09-09-22	13/9/22
09	09.	Determination of Compaction characteristics by Standard Proctor Test	09-09-22	16-09-22	16/9/22
10	10.	Determination of Compaction characteristics by Modified Proctor Test.	21-10-22	28-10-22	10/11/22

Rajat Subira Chowdhury.  
SIGNATURE OF THE STUDENT



[Signature]  
30/11/22  
SIGNATURE OF THE TEACHER-IN-CHARGE

# HOOGHLY ENGINEERING & TECHNOLOGY COLLEGE

VIVEKANANDA ROAD, PIPULPATI  
P.O & DIST. - HOOGHLY  
PIN - 712103

NAME: RAJAT SUBHRA CHOWDHURY.

DEPARTMENT: Civil Engineering.

UNIVERSITY ROLL NO: 17601320003.

YEAR WITH SEMESTER: 3rd Year / 5th Semester.

SUBJECT WITH CODE: Soil Mechanics Laboratory. [CE (PC) 594.]

## INDEX

SERIAL NO.	EXPT NO.	NAME OF THE EXPERIMENT	DATE OF EXPT.	DATE OF SUB.	REMARKS
01	11.	Determination of Co-efficient of the permeability by Constant head method.	28-10-22	04-11-22	20/11/22
02	12.	Determination of Co-efficient of the permeability by Falling head method.	28-10-22	04-11-22	
03	13.	Determination of Undrained Shear - strength of soil by Vane Shear Test.	04-11-22	29-11-22	20/11/22
04	14.	Determination of unconfined compressive strength of soil by UC test.	04-11-22	29-11-22	
05	15.	Determination of Shear strength parameters of soil by UU triaxial Test.	04-11-22	29-11-22	
06					
07					
08					
09					
10					

Rajat Subhra Chowdhury.  
SIGNATURE OF THE STUDENT



20/11/22  
SIGNATURE OF THE TEACHER-IN-CHARGE

# HOOGLHY ENGINEERING AND TECHNOLOGY COLLEGE

DEPARTMENT: -COMPUTER SCIENCE & ENGINEERING

Name of the Student: - *Sulagna Das*

UNIVERSITY Roll: - *17600321096*

Subject Name: - *Software Engineering Lab*

Paper Code: - *ESC591*

## INDEX

Experiment No.	NAME OF THE ASSIGNMENT	Assignment Held	Assignment Checked	Remarks	Signature
01	Creation of use case diagram	15/07/22	22/07/22		<i>Das</i>
02	Creation of UML activity diagram	22/07/22	29/07/22		<i>Das</i>
03	Creation of UML class diagram	29/07/22	5/08/22		<i>Das</i>
04	Creation of UML class diagram for hospital management system	5/08/22	26/08/22		<i>Das</i>
05	Draw a dfd diagram for university registration system	26/08/22	09/09/22		<i>Das</i>
06	Draw an ER diagram for banking management system	09/09/22	16/09/22		<i>Das</i>
07	Draw an ER diagram for a commercial banking.	16/09/22	28/10/22		<i>Das</i>
08	Draw work breakdown structure using U.S Project	28/10/22	5/11/22		<i>Das</i>

*Das*  
SIGNATURE: LAB IN - CHARGE

Department of Computer Science & Engineering  
Hooghly Engineering & Technology College



Lab Day: 08

Name: Sulagna Das

Roll: 94

Paper Name: software Engineering lab

Paper Code: ESC591

Department: CSE

Year: 3<sup>rd</sup>

Title of the Assignment/Work: Draw work break down structure using MS Project.

Learning Outcome: we are able to learn work break down structure using MS Project.

Blooms Taxonomy Level Satisfy:

Remember  Understand  Apply  Analyze  Evaluate  Create

Sulagna Das      5/11/22

Signature of the Student with Date

Sulagna Das 5/11/22

Signature of Lab In charge

Signature of Technical Assistant



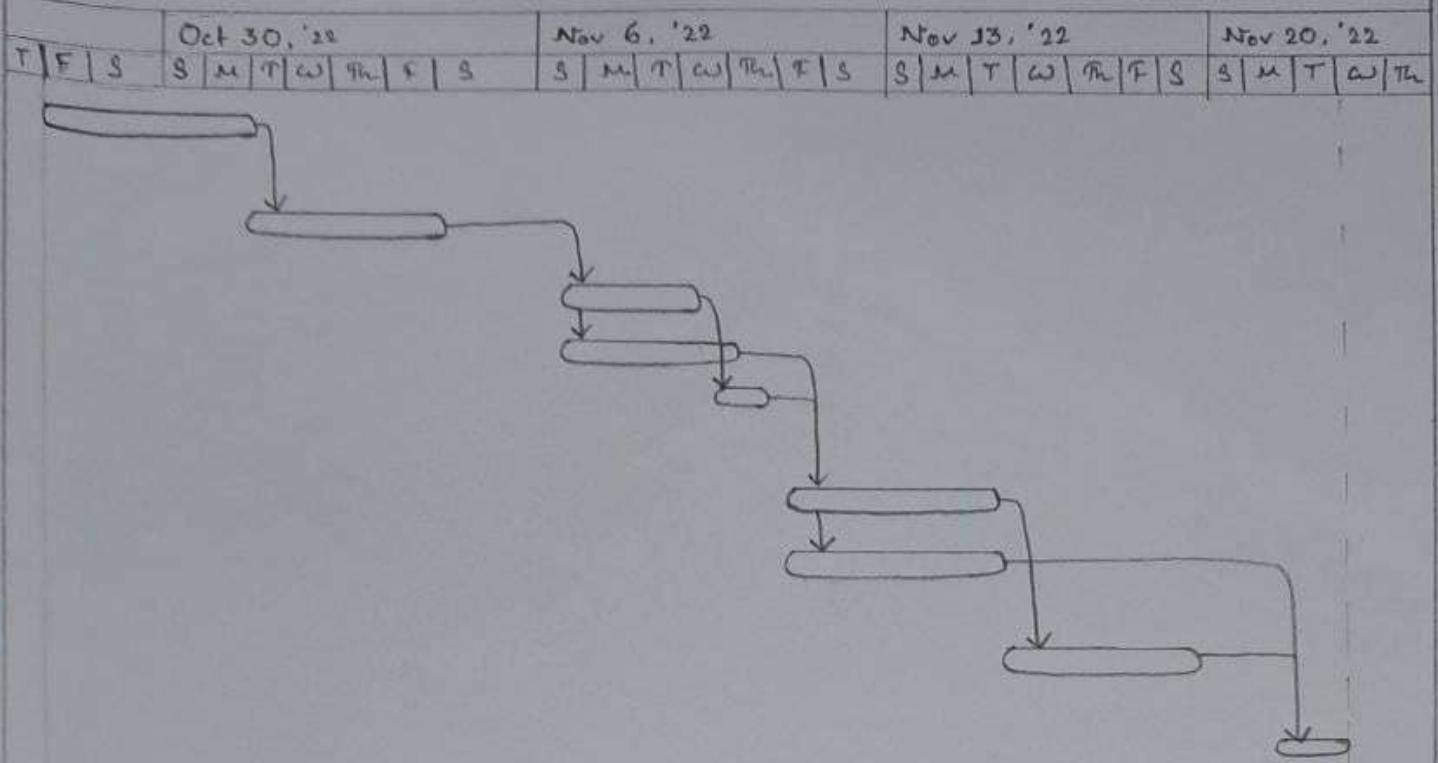
3) Draw a work break down (WBS) structure for creating system Prototypes and Prepare network diagram and Gantt chart using MS Project. The activity information is shown in Figure below:

<u>Activity</u>	<u>Predecessor</u>	<u>Duration</u>
A. Determine Prototype screens and reports	NONE	2
B. Determine report and screen contents	A	4
C. Create report prototypes	B	3
D. Create screen prototypes	B	4
E. Obtain report Prototypes feedback	C	1
F. Obtain screen Prototypes feedback	D	2
G. Modify report prototypes	E	2
H. Modify screen Prototypes	F	4
I. Obtain final approval	G, H	2

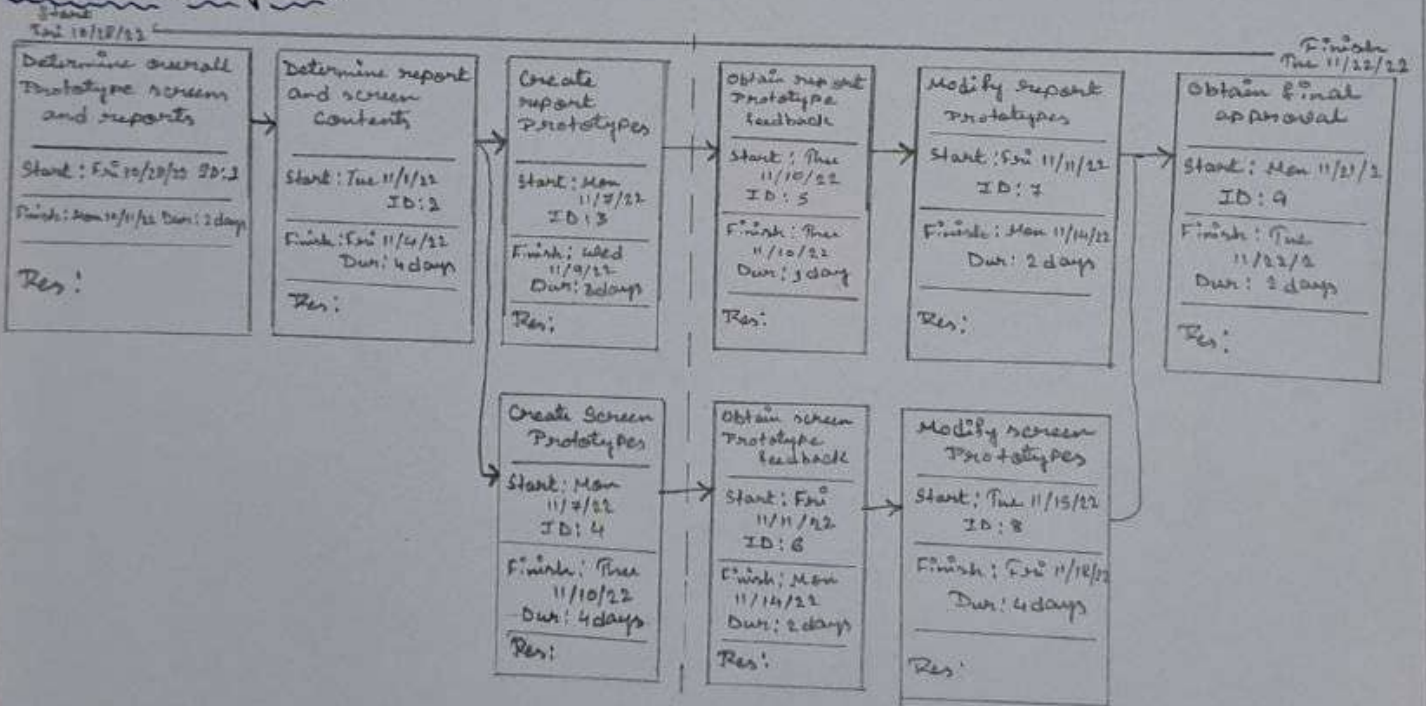
### System Prototypes

<u>Task</u> <u>code</u>	<u>Task Name</u>	<u>Duration</u>	<u>Start</u>	<u>Finish</u>	<u>Predecessor</u>
■	Determine Prototype screens and reports	2 days	Fri 10/28/22	Mon 10/31/22	
■	Determine report and screen contents	4 days	Tue 11/1/22	Fri 11/4/22	1
■	Create report Prototypes	3 days	Mon 11/7/22	Wed 11/9/22	2
■	Create screen Prototypes	4 days	Mon 11/7/22	Thu 11/10/22	2
■	Obtain report Prototypes feedback	1 days	Thu 11/10/22	Thu 11/10/22	3
■	<del>Modify</del> Obtain screen Prototypes feedback	2 days	Fri 11/11/22	Mon 11/14/22	4
■	Modify report Prototypes	2 days	Fri 11/11/22	Mon 11/14/22	5
■	Modify Screen Prototypes	4 days	Tue 11/15/22	Fri 11/18/22	6
■	Obtain final approval	2 days	Mon 11/21/22	Tue 11/22/22	7, 8

Gantt chart



Network Diagram:



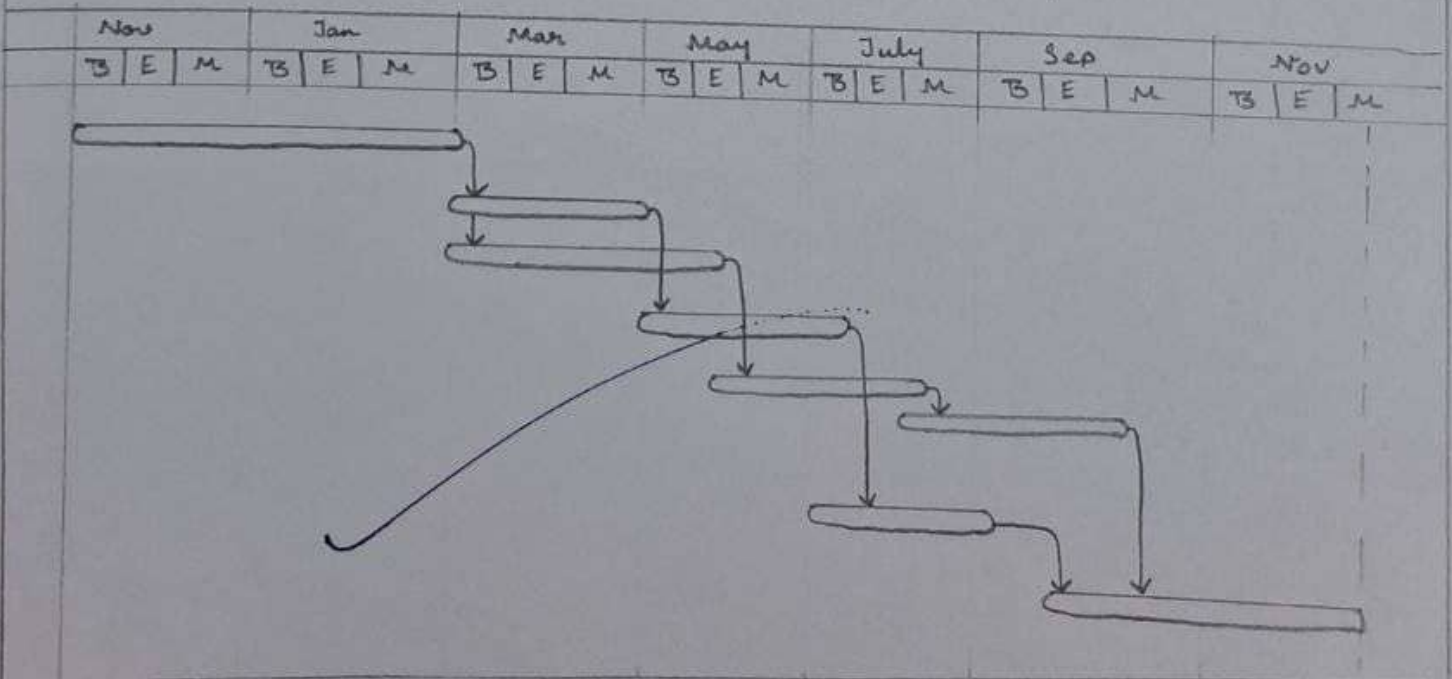
2) A Project description is given below:

- Requirement Gathering and analysis Design 90 Days
- Design
  - a) Database Design 45 Days
  - b) Interface Design 60 Days
- Coding
  - a) Database Coding 45 Days
  - b) Interface coding 50 Days
- Testing
  - a) Interface Testing 40 Days
  - b) Database Testing 45 Days
- Implementation 60 Days

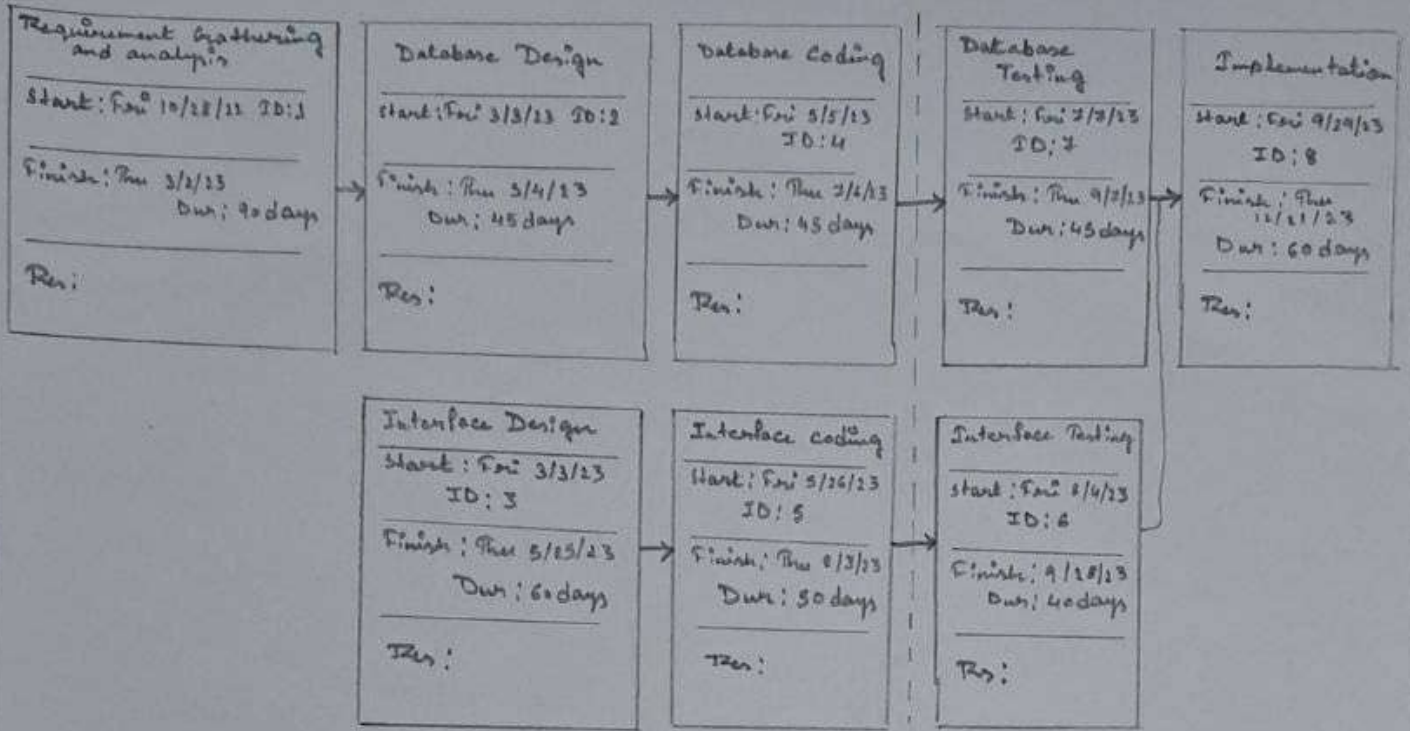
Draw a work break down (WBS) structure for the above mentioned Project and Prepare network and Gantt chart using MS-Project.

Task node	Task Name	Duration	Start	Finish	Predecessors
-	Requirement Gathering and analysis	90 days	Fri 10/28/22	Thu 3/2/23	
-	Database Design	45 days	Fri 3/3/23	Thu 5/4/23	1
-	Interface Design	60 days	Fri 3/3/23	Thu 5/25/23	1
-	Database coding	45 days	Fri 5/5/23	Thu 4/6/23	2
-	Interface Coding	50 days	Fri 5/26/23	Thu 8/3/23	3
-	Interface testing	40 days	Fri 8/4/23	Thu 9/28/23	5
-	Database testing	45 days	Fri 7/7/23	Thu 9/7/23	4
-	Implementation	60 days	Fri 9/29/23	Thu 12/21/23	6,7

Gantt chart +



Network Diagram:



Department of Computer Science & Engineering  
Hooghly Engineering & Technology College



Lab Day: 07

Name: Sulagna Das

Roll: 94

Paper Name: Software Engineering Lab

Paper Code: ESC 591

Department: Computer Science and Engineering

Year: 3rd

Title of the Assignment/Work: Draw an ER diagram for a commercial bakery.

Learning Outcome: all are able to learn how to draw an ER diagram for a commercial bakery.

Blooms Taxonomy Level Satisfy:

Remember  Understand  Apply  Analyze  Evaluate  Create

Sulagna Das 28/10/22

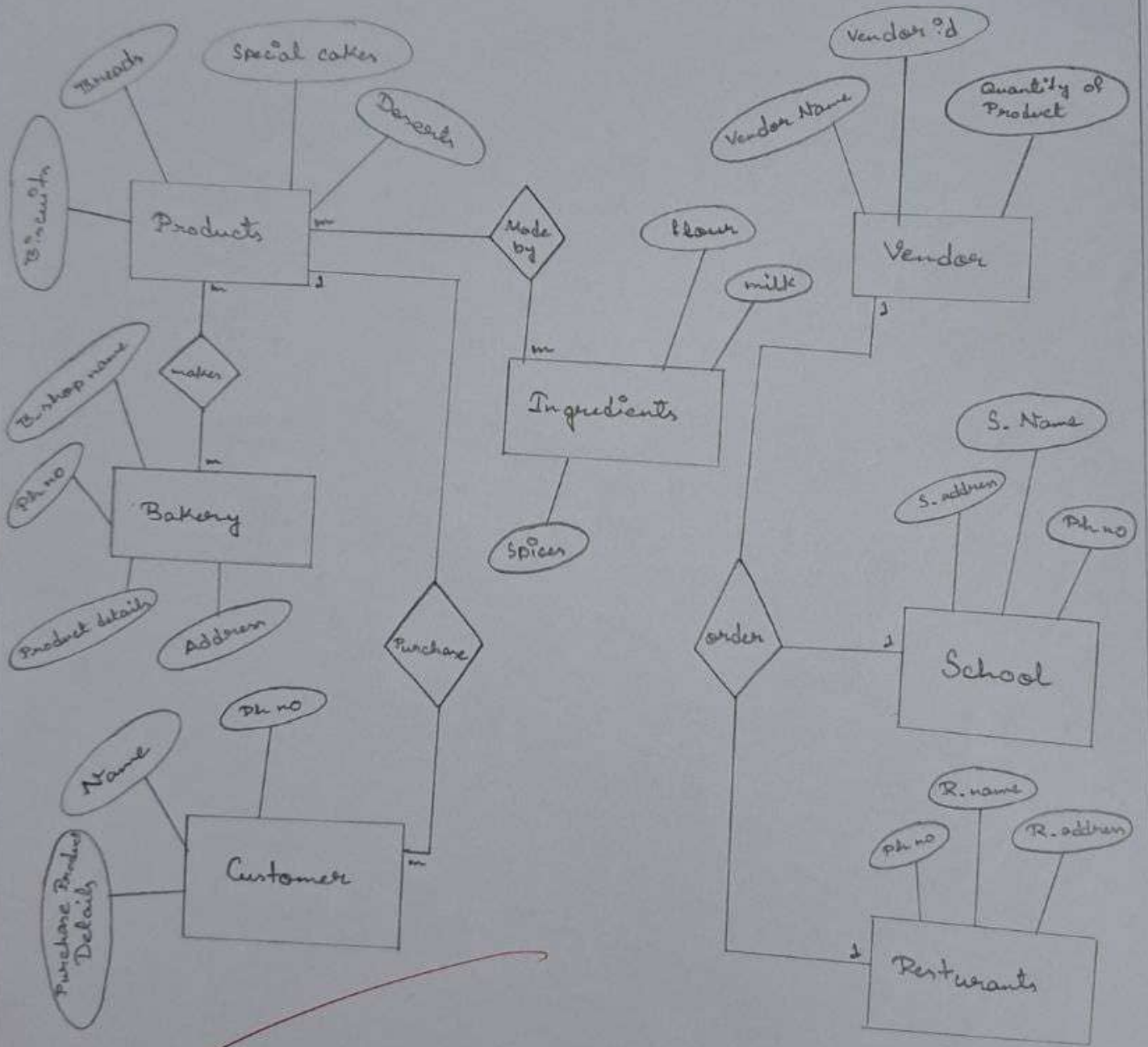
Signature of the Student with Date

Sulagna Das 28/10/22

Signature of Lab In charge

Signature of Technical Assistant

Q) Draw an ER diagram for the following situation, a commercial bakery makes many different products. This products includes breads, deserts, special cakes and many other baked goods. Ingredients such as flour, spices, milk are purchased from vendors sometimes ingredients from vendors sometimes ingredients purchase from a single vendor and other times ingredients purchase from many vendors. The bakery has commercial customers such as schools and restaurants, that regularly placed orders for baked goods. Each baked good has a specialist that oversees the setup of the bakery operation and inspects the finish product.



Department of Computer Science & Engineering  
Hooghly Engineering & Technology College



Lab Day: 06

Name: Sulagna Das

Roll: 17600121096

Paper Name: Software Engineering Lab

Paper Code: ESC 591

Department: Computer Science and Engineering

Year: 3rd

Title of the Assignment/Work: Draw a ER diagram for banking management system.

Learning Outcome: we are able to learn how to draw a ER diagram for banking management system.

Blooms Taxonomy Level Satisfy:

- Remember  Understand   Apply  Analyze  Evaluate   Create

Sulagna Das                      16/09/22

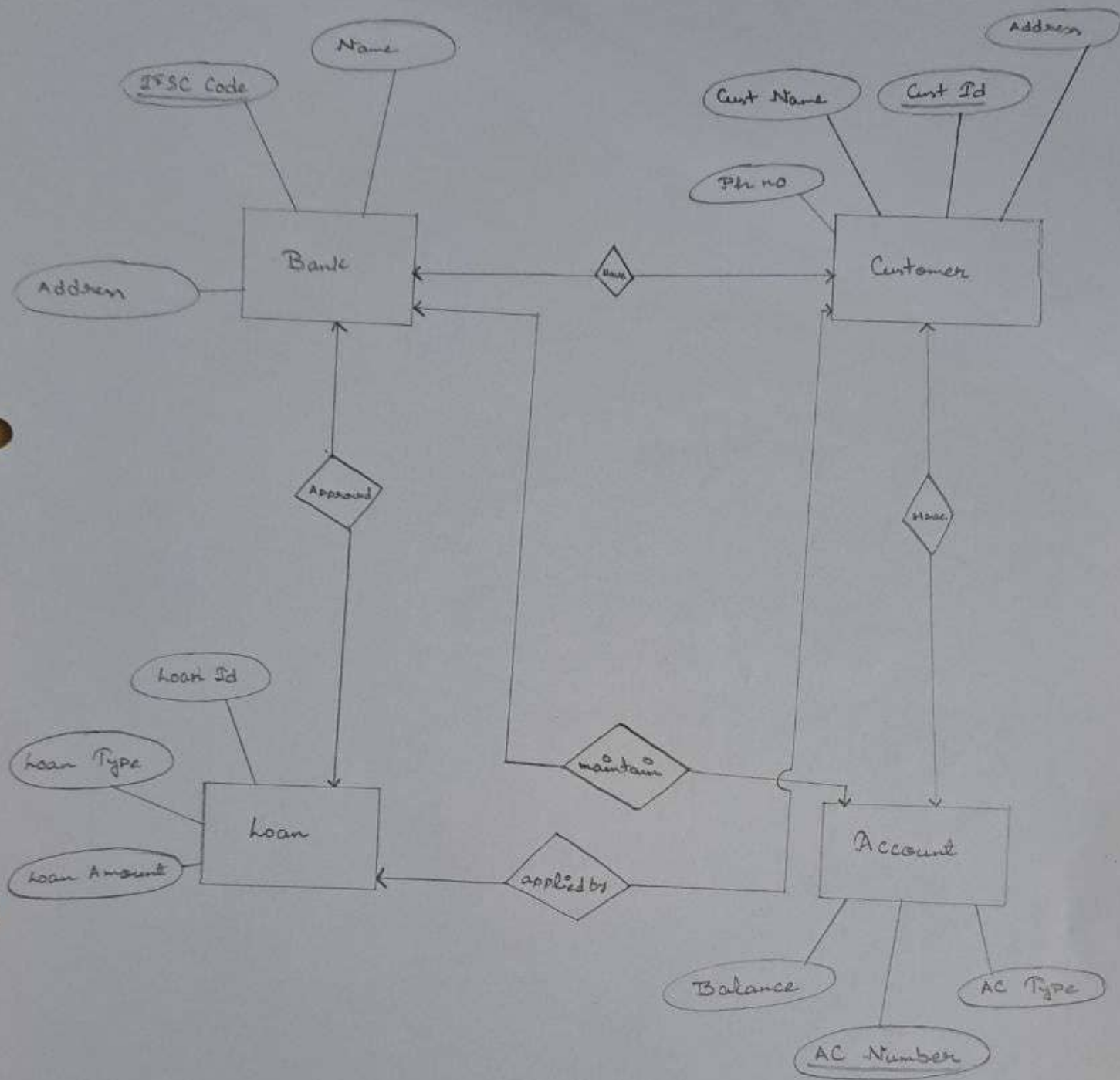
Signature of the Student with Date

Das 16/09/22

Signature of Lab In charge

Signature of Technical Assistant

Q) Draw a ER diagram for banking management system.





Department of Computer Science & Engineering  
Hooghly Engineering & Technology College



Lab Day: 05

Name: Sulagna Das

Roll: 17600121096

Paper Name: Software Engineering Lab

Paper Code: ESC 591

Department: Computer Science and Engineering

Year: 3rd

Title of the Assignment/Work: Draw a dfd diagram (level 0 and level 1) for University registration system.

Learning Outcome: We are able to learn how to draw a dfd diagram (level 0 and level 1) for University registration system.

Blooms Taxonomy Level Satisfy:

Remember  Understand  Apply  Analyze  Evaluate  Create

Sulagna Das      9/09/22

Signature of the Student with Date

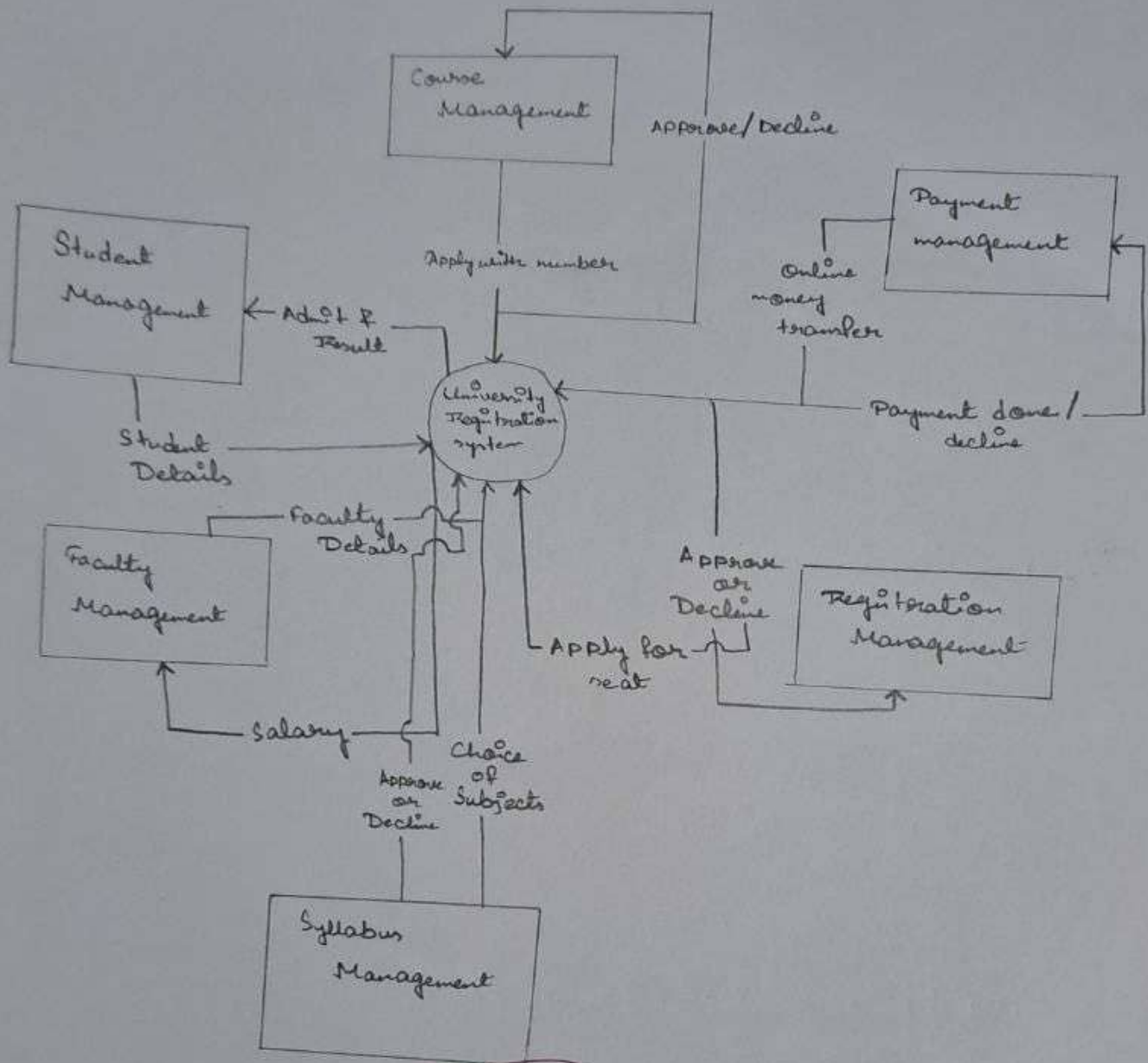
Sulagna Das 9/9/22

Signature of Lab In charge

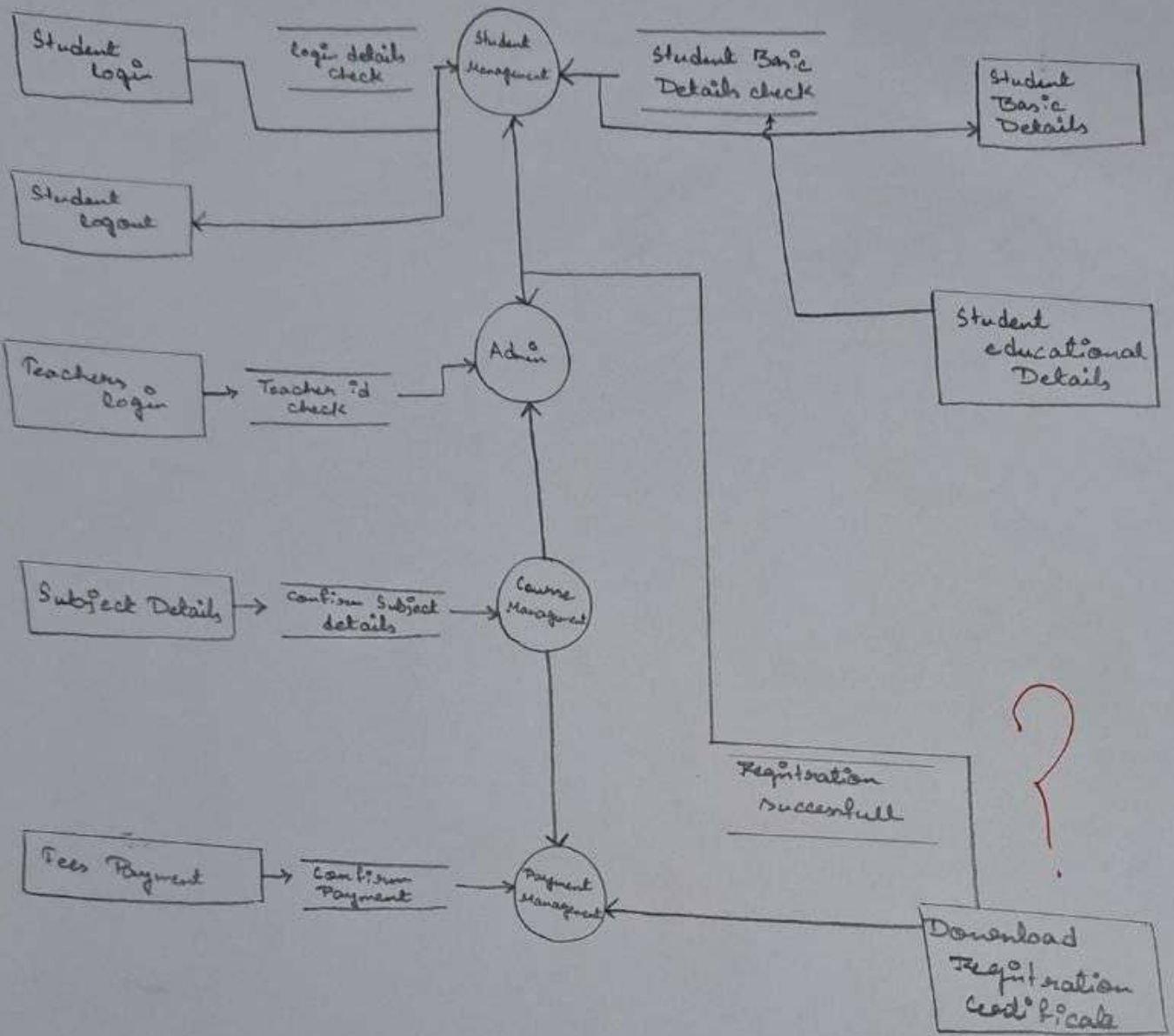
Signature of Technical Assistant

Q) Draw a dPd diagram (level 0 and level 1) for university registration system.

level 0 →



Level 1 →



Department of Computer Science & Engineering  
Hooghly Engineering & Technology College



Lab Day: 04

Name: Sulagna Das

Roll: 17600121096

Paper Name: Software Engineering Lab

Paper Code: E30591

Department: Computer Science and Engineering

Year: 3<sup>rd</sup>

Title of the Assignment/Work: Create an UML class diagram for a hospital management system.

Learning Outcome: all are able to learn how to create an UML class diagram for hospital management system.

Blooms Taxonomy Level Satisfy:

Remember  Understand  Apply  Analyze  Evaluate  Create

Sulagna Das      26/08/22  
Signature of the Student with Date

Sulagna Das 26/08/22  
Signature of Lab In charge

\_\_\_\_\_  
Signature of Technical Assistant

Department of Computer Science & Engineering  
Hooghly Engineering & Technology College



Lab Day: 03

Name: Sulagna Das

Roll: 17600121096

Paper Name: Software Engineering Lab

Paper Code: ESC591

Department: Computer Science and Engineering Year: 3rd

Title of the Assignment/Work: Create an UML class diagram for an online student management system.

Learning Outcome: We are able to learn how to create an UML class diagram.

Blooms Taxonomy Level Satisfy:

Remember  Understand  Apply  Analyze  Evaluate  Create

Sulagna Das

5/08/22

Signature of the Student with Date

Sulagna Das 5/8/22

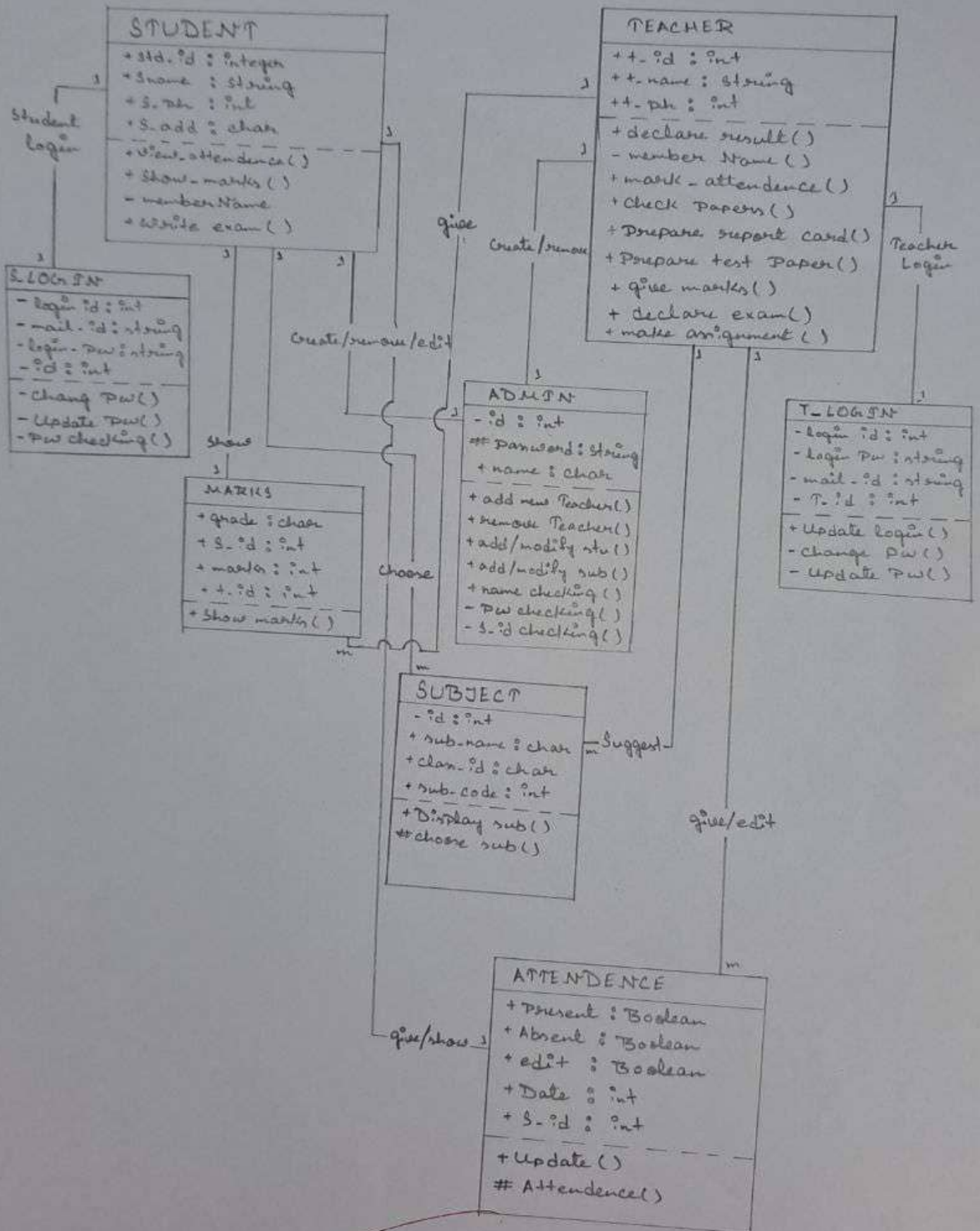
Signature of Lab In charge

Signature of Technical Assistant

Q> Create a class diagram for an online student management system considering entities given below:

1) Student 2) Teacher 3) Subject 4) Marks

Depict the relationship between every entity (:P required)



Department of Computer Science & Engineering  
Hooghly Engineering & Technology College



Lab Day: 02

Name: Sulagna Das

Roll: 17600121096

Paper Name: Software Engineering Lab

Paper Code: ESC591

Department: Computer Science and Engineering

Year: 3rd

Title of the Assignment/Work: Create an UML activity diagram for an online library management system.

Learning Outcome: We are able to learn how to create an UML activity diagram.

Blooms Taxonomy Level Satisfy:

Remember  Understand  Apply  Analyze  Evaluate  Create

Sulagna Das

29/07/22

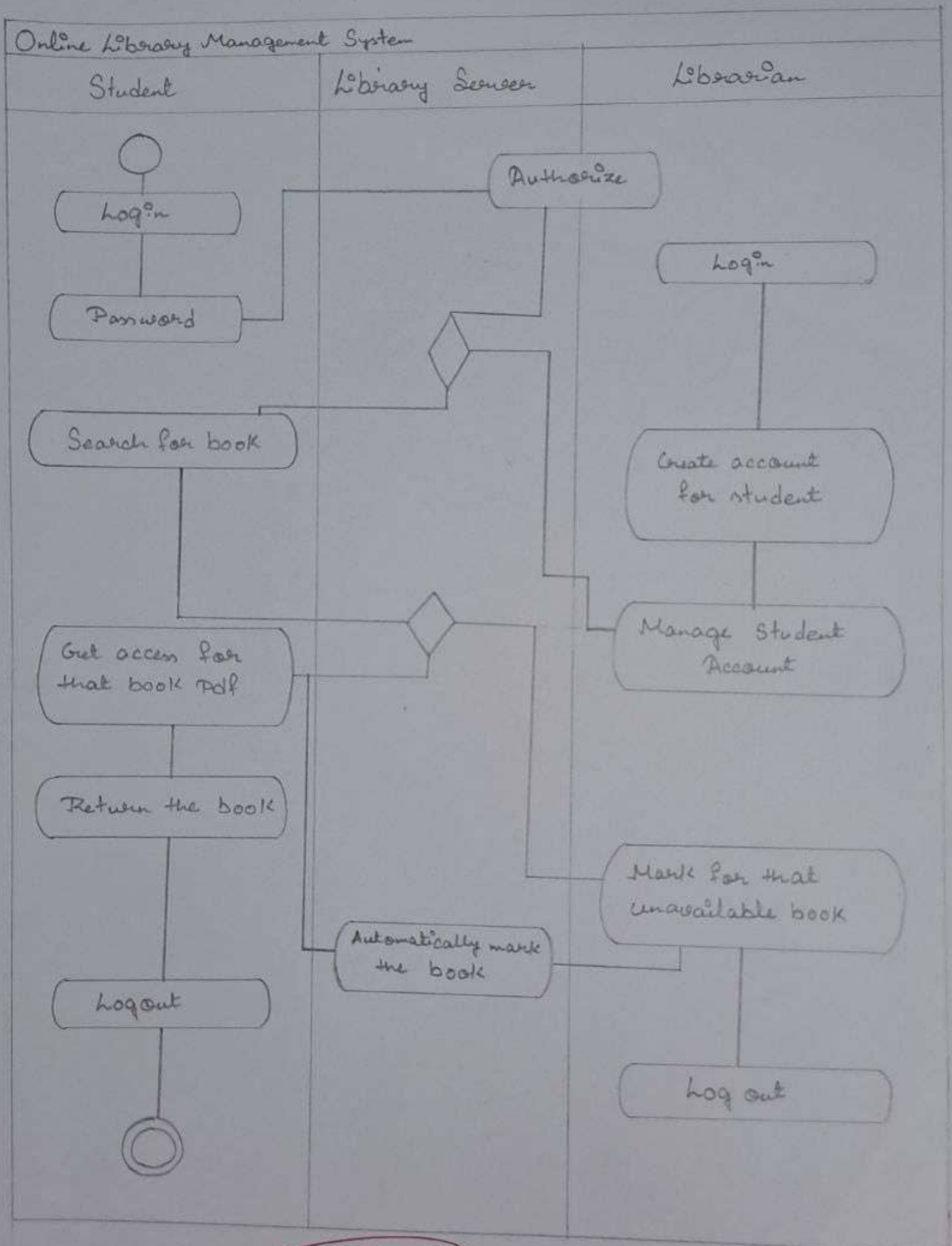
Signature of the Student with Date

Das 29/7/22

Signature of Lab In charge

Signature of Technical Assistant

3) To create an UML Activity diagram for an online Library Management System.





Department of Computer Science & Engineering  
Hooghly Engineering & Technology College



Lab Day: 01

Name: Sulagna Das

Roll: 17600121096

Paper Name: Software Engineering Lab

Paper Code: ESC591

Department: Computer Science and Engineering

Year: 3<sup>rd</sup>

Title of the Assignment/Work: Create an use case diagram of online shopping cart system and online banking management system.

Learning Outcome: We are able to learn how to create an use case diagram & consider as much realistic use cases is possible.

Blooms Taxonomy Level Satisfy:

Remember  Understand  Apply  Analyze  Evaluate  Create

Sulagna Das

22/7/22

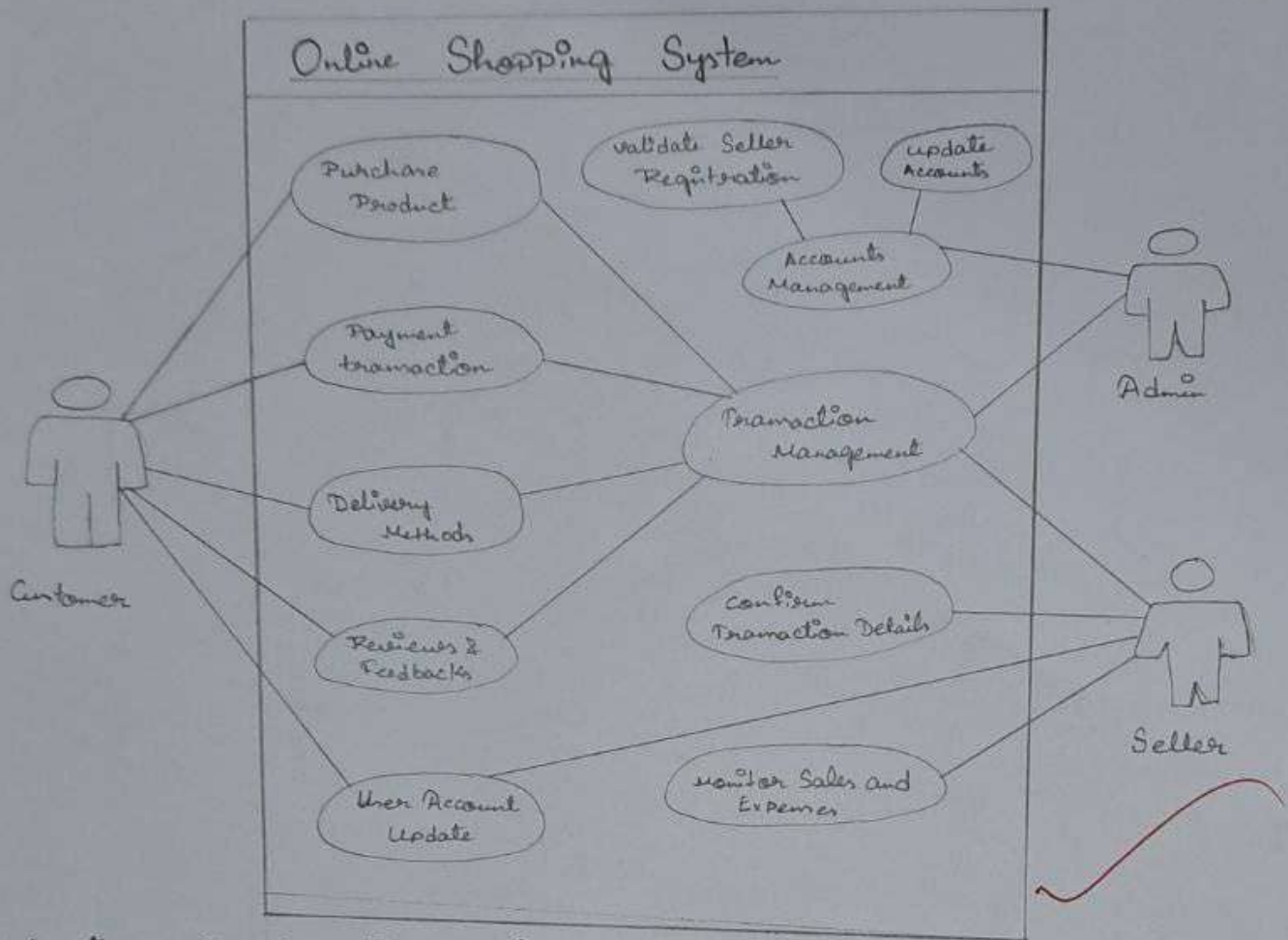
Signature of the Student with Date

Sulagna Das 22/07/22

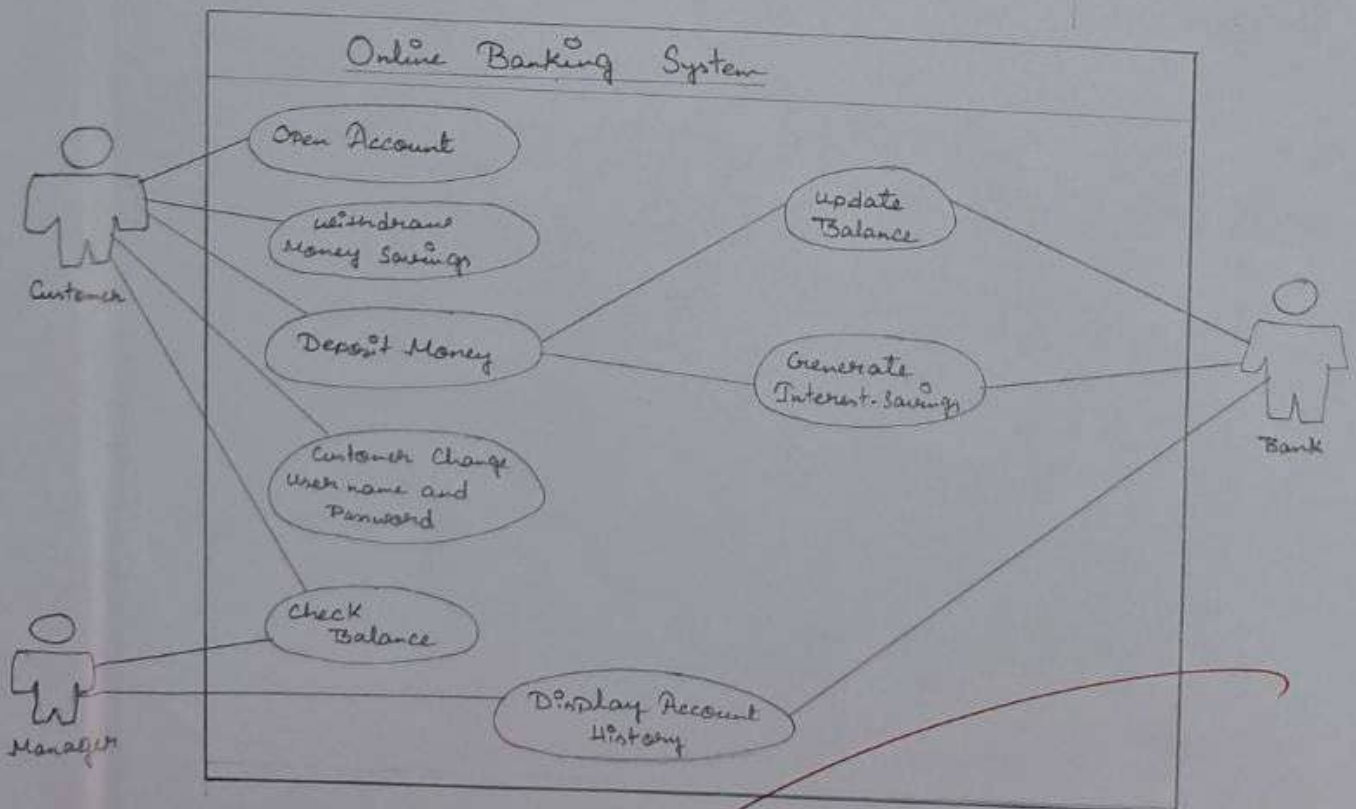
Signature of Lab In charge

Signature of Technical Assistant

1> To Create an use case diagram for an online shopping cart system considering as much realistic use cases as possible.



2> To create an use case diagram for an online banking management system.



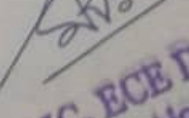
Maulana Abul Kalam Azad University of Technology, West Bengal  
Syllabus for B. Tech in Electronics & Communication Engineering  
(Applicable from the academic session 2018-2019)

C392	Digital System Design Lab	0L:0T:2P	1 credits
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1. Introduction to Digital Electronics Lab- Nomenclature of Digital ICs, Specifications, Study of the Data Sheet, Concept of Vcc and Ground, Verification of the Truth Tables of Logic Gates using TTL ICs.
2. Implementation of the Given Boolean Function using Logic Gates in Both Sop and Pos Forms.
3. Verification of State Tables of Rs, J-k, T and D Flip-Flops using NAND & NOR Gates
4. Implementation and Verification of Decoder/De-Multiplexer and Encoder using Logic Gates.
5. Implementation of 4x1 Multiplexer using Logic Gates.
6. Implementation of 4-Bit Parallel Adder Using 7483 IC.
7. Design, and Verify the 4- Bit Synchronous Counter
8. Design, and Verify the 4-Bit Asynchronous Counter.
9. Simulation of MOS Inverter with different loads using PSPICE software
10. Simulation of CMOS Inverter for different parameters  $K_n$ ,  $K_p$  as a design variable in suitable circuit simulator software.
11. Design of a 4-bit Multiplexer using VHDL\Verilog
12. Design of a decade counter using VHDL\Verilog.
13. Design of a 3-input NAND gate and its simulation using suitable logic simulator

**Book List**

1. Douglas L.Perry, "VHDL: Programming by Example", McGraw-Hill, 2002.
2. Charles H. Roth, Lizy Kurian John, "Digital systems design using VHDL", Thomson, 2008.

  
DIC, ECE Deptt.  
HETC, Hooghly.

Maulana Abul Kalam Azad University of Technology, West Bengal  
Syllabus for B. Tech in Electronics & Communication Engineering  
(Applicable from the academic session 2018-2019)

EC392	Digital System Design Lab	0L:0T:2P	1 credits
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11. Design of a 4-bit Multiplexer using VHDL\Verilog
12. Design of a decade counter using VHDL\Verilog.
13. Design of a 3-input NAND gate and its simulation using suitable logic simulator

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DIC, ECE Deptt.  
HETC, Hooghly.

# LABORATORY MANUAL FOR DIGITAL SYSTEM DESIGN (EC 492)

FOR B. Tech. (ECE/EE)



DEPARTMENT OF ELECTRONICS AND COMMUNICATIONS  
ENGINEERING

HOOGHLY ENGINEERING & TECHNOLOGY COLLEGE

[Approved by AICTE, Govt. of India, Affiliated to MAKAUT (Formerly WBUT), Govt. of WB]

HOOGHLY, WEST BENGAL-712103

  
DIC, ECE Deptt.  
HETC, Hooghly.

## COURSE PLAN

Sl. No.	Topics/Jobs/Programs/Experiments to be covered	Assigned Number of Lectures	Assigned Number of Practical Classes
01	Introduction to Digital Electronics Lab-Nomenclature of Digital ICs, Specifications, Study of the Data Sheet, Concept of Vcc and Ground, Verification of the Truth Tables of Logic Gates using TTL ICs.	0	2
02	Implementation of the Given Boolean Function using Logic Gates in Both SOP and POS forms.	0	2
03	Implementation of EXOR and EXNOR using Universal logic gates (NAND & NOR gates)	0	2
04	Implementation of half adder, half subtractor, full adder and full subtractor using basic logic gates	0	2
05	Implementation of 4-Bit Parallel Adder Using 7483 IC.	0	2
06	Implementation and Verification of Decoder and Encoder using Logic Gates.	0	2
07	Implementation of 4X1 Multiplexer and 1 X 4 De-Multiplexer using Logic Gates.	0	2
08	Verification of State Tables of Rs, J-k, T and D Flip-Flops using NAND & NOR Gates	0	2
09	Design and verify the 4- Bit Synchronous Counter	0	2
10	Design, and verify the 4-Bit Asynchronous Counter.	0	2
11	Design of a 3-input NAND gate and its simulation using a suitable logic simulator	0	2
12	Design of a 4-bit Multiplexer using VHDL\Verilog	0	2

  
 DIG, ECE Deptt.  
 HETC, Hooghly.

**HOOGLHY ENGINEERING AND TECHNOLOGY COLLEGE**  
**VIVEKANANDAROAD, PIPULPATI**  
**P.O. & DIST.- HOOGHLY**  
**PIN - 712103**



**NAME:-** Surenda Biswas.  
**DEPARTMENT:-** ECE  
**UNIVERSITY ROLL NO :-** 17632322007  
**YEAR:-** 2nd  
**SUBJECT WITH CODE :-** Digital System & Design Lab, EC 392  
**SEMESTER:-** 3rd

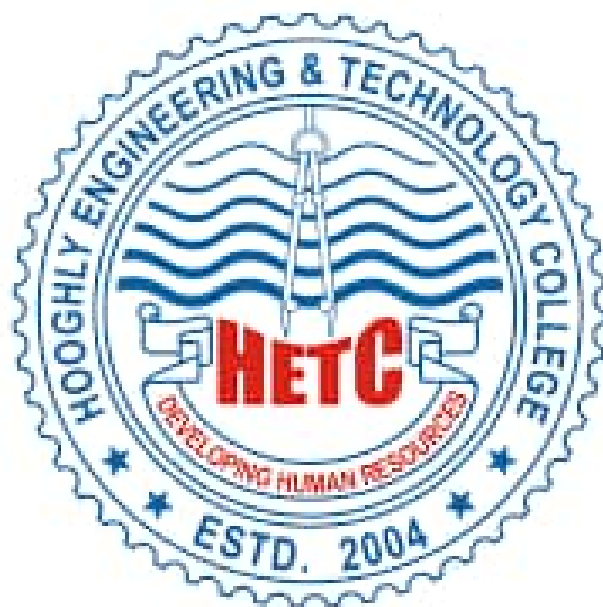
# INDEX

SL NO	EXPT NO./ASSIGMT NO.	NAME OF THE EXPERIMENT/Assignment	DATE OF SUBMISSION	PAGE NO.
01	1	Verification of the truth tables of TTL Gates	26/08/2022	1-8
02	3A	Implementing X-NOR & X-NOR function using Universal logic gate (NAND & NOR gate)	02/09/2022	
03	3B	Implementing X-OR & X-NOR function using Universal logic gate (NOR)	02/09/2022	
04	5	Implementing 4-bit parallel adder using 7483 IC	02/09/2022	2/9/22
05	4A	Design & verification of the truth tables of half & full adder circuit	09/09/2022	?
06	4B	Design & verification of the truth tables of half & full subtractor circuit	09/09/2022	9/9/22
07	2	Implementation of the given Boolean Function using logic gates in SOP & POS		
08	6	To design and implement a decoder and encoders using logic gates	21/10/2022	21/10/22
09	7A	Verification of the truth table of the multiplier 9:1 using logic gates	21/10/2022	
10	7B	Verification of the truth table of the Demultiplexer 4:1 using logic gates	21/10/2022	
11	8	To design & implement SR, D, JK & B Flip Flop using NAND gate.	16/11/2022	16/11/22
12	9	To design a 4-bit Asynchronous Counter using JK FF.	16/11/2022	
13				
14				
15				
16				
17				
18				

SIGNATURE OF STUDENTS

  
 16/11/22  
 SIGNATURE OF TEACHER-IN-CHARGE

# Hooghly Engineering & Technology College



Practical Manual, Syllabus and Student Copy

(2018-2023)



# HOOGLY ENGINEERING AND TECHNOLOGY COLLEGE



VIVEKANANDA ROAD, PIPULPATI,  
P.O. & DIST. : HOOGLY, PIN : 712 103



Name Sudip Kumar Maik

Stream & Roll No. CSE-11 (B) Gr B-11 Pr. 2

Batch 2023 2027 Subject Workshop

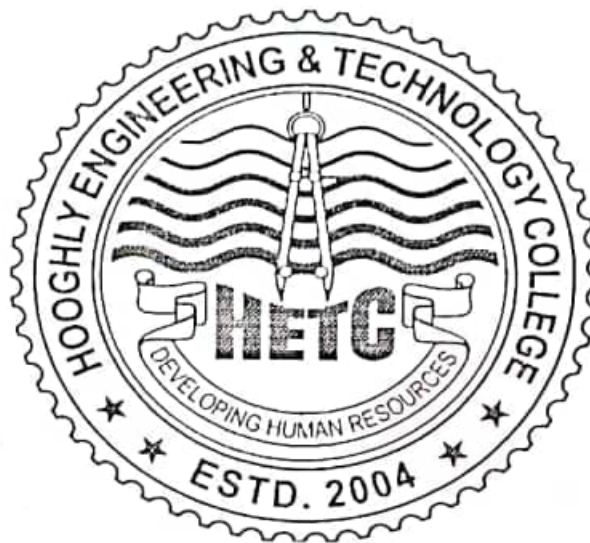
Year 2023

From (Months) .....

# Hooghly Engineering and Technology College

Vivekananda Road, Pipulpatl, P.O. & Dist. Hooghly

## Department of Mechanical Engineering



### Workshop/Manufacturing Practice

(ES-ME 192/292)

### Course Details, Theory & Assignments

Session: 2022-23

89



H.O.D.  
Mechanical Engineering  
Hooghly Engineering & Technology College

## Workshop/Manufacturing Practices Code: ES-ME192/292

Contacts: H.O.D.

Credits: 3

### SYLLABUS

#### A Lectures & videos:

1. Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing methods
2. CNC machining, Additive manufacturing
3. Fitting operations & power tools
4. Electrical & Electronics
5. Carpentry
6. Plastic moulding, glass cutting
7. Metal casting
8. Welding (arc welding & gas welding), brazing

#### B Workshop Practice:

1. **Machine shop (8 hours)** - Typical jobs that may be made in this practice module:  
i) To make a pin from a mild steel rod in a lathe. ii) To make rectangular and vee slot in a block of cast iron or mild steel in a shaping and / or milling machine.
2. **Fitting shop (8 hours)**- Typical jobs that may be made in this practice module:  
i) To make a Gauge from MS plate.
3. **Carpentry (8 hours)**- Typical jobs that may be made in this practice module:  
i) To make wooden joints and/or a pattern or like.
4. **Welding shop (8 hours (Arc welding 4 hrs + gas welding 4 hrs))**- Typical jobs that may be made in this practice module:  
i) **ARC WELDING (4 hours)**- To join two thick (approx 6mm) MS plates by manual metal arc welding.  
ii) **GAS WELDING (4 hours)**- To join two thin mild steel plates or sheets by gas welding.
5. **Casting (8 hours)**- Typical jobs that may be made in this practice module:  
i) One/ two green sand moulds to prepare, and a casting be demonstrated.
6. **Smithy (4 hours)** - 4 hours Typical jobs that may be made in this practice module:  
i) A simple job of making a square rod from a round bar or like.
7. **Plastic moulding & Glass cutting (4 hours)**- Typical jobs that may be made in this practice module:  
i) For plastic moulding, making at least one simple plastic component should be made.  
ii) For glass cutting, three rectangular glass pieces may be cut to make a kaleidoscope using a black colour diamond cutter, or similar other components may be made.
8. **Electrical & Electronics (8 hours)**  
i) Familiarization with LT switchgear elements, making its sketches and noting down its specification. Kitkat fuse, Glass cartridge fuse, Plastic fuse holders (optional), Iron clad isolators, MCB style isolators, Single phase MCB, Single-phase wire, wiring cable.  
ii) Demonstration of domestic wiring involving two MCB, two piano key switches, one incandescent lamp, one LED lamp and plug point.  
iii) Simple wiring exercise to be executed to understand the basic electrical circuit.  
iv) Simple soldering exercises to be executed to understand the basic process of soldering.  
v) Fabrication of a single-phase full wave rectifier with a step down transformer using four diodes and electrolytic capacitor and to find its volt-ampere characteristics to understand basic electronic circuit fabrication.



# Workshop/Manufacturing Practices

## Code: ES-ME 192/292

Contacts: T.L.D

Credits: 3

### ASSIGNMENTS LIST

1. Manufacturing a gauge from MS plate as per given drawing by performing different Fitting and Bench Work operations
2. Joining two thick (6mm) MS plates as per given drawing by performing V-Butt joint by MMA welding
3. Joining two thin (3mm) metal sheets as per given drawing by performing Lap joint by Oxy-Acetylene Welding
4. Manufacturing a Job as per given drawing by performing different machining operations on an Engine Lathe
5. Making a Flat Surface on a MS block as per given drawing by performing shaping operation on a Shaping Machine
6. Making a slot (6 mm × 3 mm) on a MS block as per given drawing by performing milling operation on a Milling Machine
7. Forming a Cross half lap joint as per given drawing by performing different carpentry or Pattern making work.
8. Making a sand mould with the pattern developed earlier by performing sand mould making operations.
9. Making a casting job using aluminum as per given drawing by using the sand mould prepared earlier by performing different sand mould casting operations.
10. Making a plastic mould of a component as per the desire shape and size given in fig.
11. Making a kaleidoscope using three rectangular glass pieces cutting by a black color diamond cutter.



# Hooghly Engineering & Technology College

Vivekananda Road, Pipulpati  
 P.O & Dist. - Hooghly, Pin - 712103

## Department of Mechanical Engineering



Name :					
Year :	Ist	Semester :	1st/2nd	Batch :	2022-202
Class Roll No. :	University Roll No :				
Lab Name	Workshop/Manufacturing Practices		Code	ES-ME 192/292	

### INDEX

Sl No.	Title of the Experiment / Job	Date of Experiment	Date of Submission	Page No
01	Manufacturing a gauge from MS plate as per given drawing by performing different fitting and bench work operation.	21.09.2023 12.10.2023	2.11.2023	
02	Joining two thick (6mm) MS plate as per given drawing by performing v-Butt joint by MMA welding.	23/11/2023	13/11/2023	
03	Manufacturing a pin as per given drawing by performing different machining operation on an engine lathe.	13/12/2023	21/12/2023	
04	Finish two opposite side of MS block as per given drawing by performing shaping operation on a shaping machine.	27/11/2023	28/11/2024	
05	Make a slot (6mm) on a MS block as per given drawing by performing milling operation on a milling operation.	21/12/2023	4/1/2024	
06				
07				
08				
09				
10				

  
 Signature of the Faculty-in-Charge  


# Hooghly Engineering & Technology College

Vivekananda Road, Pipulpati  
P.O & Dist. - Hooghly, Pin - 712103

## Department of Mechanical Engineering



### LAB REPORT

Lab Name with Code :	Workshop/Manufacturing Practices
----------------------	----------------------------------

Title of the Experiment / Job :	Make slots (6 mm) on a MS block as per given drawing by performing milling operation. on a milling operation
---------------------------------	--

Name :					
Year :	1ST	Semester :	1ST / 2ND	Session :	2023-2024
Class Roll No. :	117	University Roll No. :	J760012346		
Date of Experiment :	21/12/2023	Date of Submission :	4/1/2024		

Signature of the Faculty in-Charge

• Title :- Make a slot (6 mm) on a MS block as per given drawing by performing milling operation on a milling machine.

• Aim :- To obtain basic knowledge about milling operation and milling machine.

• Raw material :- mild steel.

• Size :- 50 mm x 52 mm

• Specification of Machine :- FV-PM80, kW/HP - 0.75/1.0, Hz - 50, RPM - 1390  
V-415, A° = 50, A - 1.8, INS - F, DUTY - SJ, n% - 0.75

• Tools Required :-

(i) 760 mm x 178 mm column and knee type universal milling machine.

(ii) machine vice and vice handle.

(iii) 12" steel rule

(iv) 6" try square

(v) 6" out side caliper

(vi) 4" prick punch.

(vii) 250 Ball peen Hammer.

(viii) Scriber

(ix) 12" vernier caliper

(x) 2' x 2' surface plate.

(xi) 12" vernier Height Gauge.

(xii) Spirit level

(xiii) Double Ended Spanner

(xiv) Adjustable Spanner

(xv) 3.5" x 0.25" x 1" side and Face milling cutter

(xvi) Lettering and Numbering punch.

(xvii) 400 gm. Ball peen Hammer.

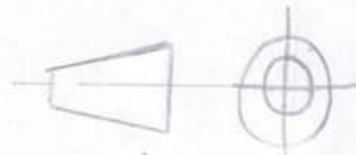
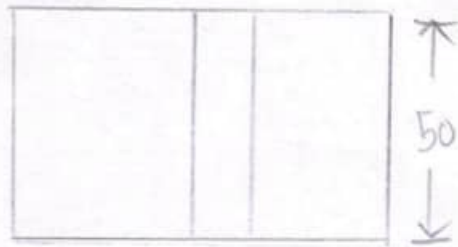
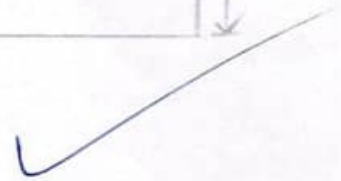
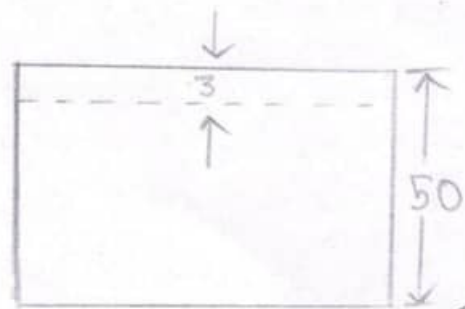
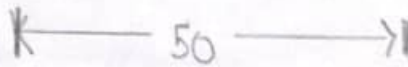
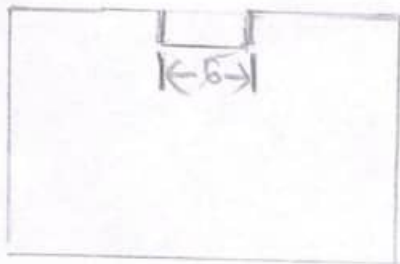
## • Procedure:

- ① Check the size of raw material by using steel rule, outside caliper and Vernier Caliper.
- ② Scribe the lines on the flat surface of the metal plate to be finished as per drawing using marking instrument like vernier Height Gauge surface plate, and try square by keeping the job on the surface plate and permanent the scribed lines by prick punch and Ball peen Hammer.
- ③ Fix the job rigidly on the machine vice of the milling machine.
- ④ Check the nomenclature of the side and Face-milling cutter.
- ⑤ Insert the Face and side milling cutter into the arbor and fix it by tightening by nut.
- ⑥ Hold the job in-between the jaws of the machine vice rigidly and level it by spirit level.
- ⑦ Place the job below the cutter and place it appropriate position by rotating cross feed and vertical feed lever.
- ⑧ Switch on the machine and coolant pump and give feed to the job under rotating the cutter by moving the table manually and automatically and complete the depth of cut.
- ⑨ Repeat the above operations until required depth is achieved.
- ⑩ After complete the milling operations, switch off the machine and remove the job from the milling vice.
- ⑪ Check the final dimensions of the job whether it is finished according to drawing using try square, vernier caliper.
- ⑫ Punch Branch Code and group number on the job for proper identification with the help of Lettering and numbering punch and Ball peen Hammer.



• Pre caution:

- ① Do not put your hands and fingers inside the moveable parts.
- ② Do not wear loose garments.
- ③ Hold the job into vice tightly.
- ④ Do not touch the cutting tools and chips during the operation.
- ⑤ Do not use too much depth and feed in the time of cutting operation.



All direction in mm

JOB DRAWING

# Hooghly Engineering & Technology College

Vivekananda Road, Pipulpati  
P.O & Dist. - Hooghly, Pin - 712103

## Department of Mechanical Engineering

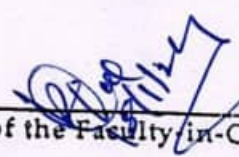


### LAB REPORT

Lab Name with Code :	Workshop/Manufacturing Practices
-------------------------	----------------------------------

Title of the Experiment/ Job :	Finish two opposite side of MS block as per given drawing by performing shaping operation on a shaping machine.
--------------------------------------	---

Name :	Sudip Sunder Maiti				
Year :	1ST	Semester :	1ST/2ND	Session :	2023-2024
Class Roll No. :	117	University Roll No. :			
Date of Experiment :	10/1/2024	Date of Submission :	18/1/2024		

  
Signature of the Faculty in-Charge

• Title: Finish two opposite sides of MS block as per given drawing by performing shapping operation on a shapping machine.

• Aim: To obtain basic knowledge about shapping operation and shapping machine,

• Raw material: Mild steel.

• Size:  $52\text{ mm} \times 52\text{ mm}$  mm

• Specification of machine:  $F_n - PM 80, KW/HP - 0.75/1.0, W2 - 50, V - 915, A - 1.8$   
 $DUTY - S1, \eta = 75, INVS - F, A^\circ C - 50$

• Tools required:

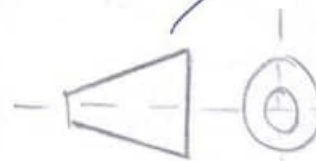
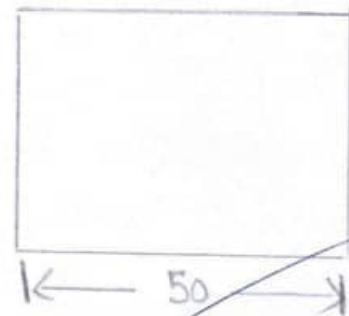
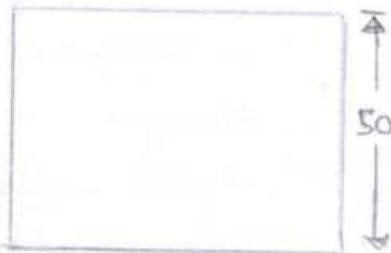
- ① 1.300 mm plain horizontal cone pulley type shapping machine.
- ② Machine vice and vice handle.
- ③ 12" Steel Rule.
- ④ 6" Try square.
- ⑤ 6" out side caliper.
- ⑥ 4" prick punch.
- ⑦ 250 gm. Ball peen Hammer.
- ⑧ Scriber
- ⑨ 12" vernier caliper
- ⑩ 2' x 2' surface plate
- ⑪ 12" vernier Height caliper
- ⑫ Tool Holder and Tool key
- ⑬ Single point shapping tool.
- ⑭ Spirit level
- ⑮ Double Ended Spanner
- ⑯ Adjustable Spanner
- ⑰ Lettering and Numbering punch
- ⑱ 400 gm. Ball peen Hammer.

## • Procedure !

- ① Check the size of raw material by using steel rule, out side Caliper and vernier caliper.
- ② Scribe the lines on the flat surface of the metal plate to be finished as per drawing using.
- ③ Mark the job as per drawing keeping it on the surface plate using vernier height gauge and permanent the scribed the lines by prick punch and Ball peen Hammer.
- ④ Fix the job rigidly on the machine vice of the shaping machine.
- ⑤ Check the tool nomenclature of square tool.
- ⑥ Fix the cutting tool into the tool holder with the help of tool key and after that hold the tool holder into the tool head of the Clapper Box rigidly.
- ⑦ Adjust the length of stroke and position of Ram with the help of Ram control lever according to job length and keeping proper approach and over ram.
- ⑧ Adjust the depth of cut by moving down the feed screw of the tool slide.
- ⑨ Switch on the machine and enter the feed to the job under the reciprocating cutting tool by moving the table manually or automatically and complete the cut.
- ⑩ After completion of the machining switch off the machine and remove the job from machine tool.
- ⑪ Check the final dimensions of the job whether it is finished according to drawing using try square, vernier caliper.
- ⑫ Punch Branch code and group number on the job for proper identification with the help of lettering and numbering punch and Ball peen Hammer.

• Precaution:

- ① Do not put your hand and fingers inside the movable parts
- ② Do not wear loose garments.
- ③ Hold the job into vice tightly.
- ④ Do not touch the cutting tools and chips during the operation.
- ⑤ Do not use too much depth and feed in the time of cutting operation.



Scale 1:1

JOB DRAWING

# INDEX

PAPER NAME: ELECTRIC MACHINE I LAB

PAPER CODE: PC-EE 491

DEPARTMENT: EE

YEAR: 2ND

SEM: 4TH

NAME	Megha Singh		
CLASS ROLL NUMBER	01	UNIVERSITY ROLL NUMBER	1760 1620001

SL. NO.	EXP. NO.	NAME OF EXPERIMENT	MARKS OBTAINED (OUT OF 10)	REMARKS (IF ANY)	TEACHER'S SIGNATURE
1.	3.	SPEED CONTROL OF DC MOTOR. [STUDY OF]	10		S V/B
2.	4.	STUDY OF THE CHARACTERISTICS OF A SEPARATELY EXCITED DC GENERATOR	10		Santosh 24/3/2022
3.		DETERMINATION OF EQUIVALENT CIRCUIT OF A SINGLE PHASE TRANSFORMER AND EFFICIENCY	10		D Bofe 24.03.2022
4.		POLARITY TEST ON A SINGLE PHASE TRANSFORMER	9.5		D Bofe 24.03.2022
5.		STUDY OF THE CHARACTERISTICS OF DC (SHUNT) MOTOR.	10		Soy 28/4/22

SIGNATURE OF FACULTY

*[Handwritten Signature]*

## INDEX

PAPER NAME: ELECTRIC MACHINES I

PAPER CODE: EE 491

DEPARTMENT: EE

YEAR: 2ND

SEM: 4TH

<b>NAME</b>	Megha Singh		
<b>CLASS ROLL NUMBER</b>	01	<b>UNIVERSITY ROLL NUMBER</b>	17601620001

SL. NO.	EXP. NO.	NAME OF EXPERIMENT	MARKS OBTAINED (OUT OF 10)	REMARKS (IF ANY)	TEACHER'S SIGNATURE
6.	5.	Measurement of speed of a DC series motor as a function of load torque.	09		DBofe 26.05.2022
7.	7(A)	Determination of Commercial efficiency of a single phase transformer.	10		DBofe 26.05.2022
8.		Study of Characteristics of DC Shunt motor Compound generator.	10		Santosh 31/5/22
9.		Study of Parallel Operation of Single phase transformer.	09		DBofe 31.05.2022

\_\_\_\_\_  
SIGNATURE OF FACULTY

**Maulana Abul Kalam Azad University of Technology, West Bengal**  
*(Formerly West Bengal University of Technology)*  
**Syllabus for B. Tech in Electrical Engineering**  
 (Applicable from the academic session 2018-2019)

<b>Name of the course</b>	<b>ELECTRIC MACHINE-I LABORATORY</b>
<b>Course Code:PC-EE491</b>	<b>Semester: 4<sup>th</sup></b>
<b>Duration: 6 months</b>	<b>Maximum marks:100</b>
<b>Teaching Scheme</b>	<b>Examination scheme:</b>
<b>Theory: 0 hr/week</b>	<b>Continuous Internal Assessment:40</b>
<b>Tutorial: 0 hr/week</b>	<b>External Assessment: 60</b>
<b>Practical: 2 hrs/week</b>	
<b>Credit Points:1</b>	
	<b>Laboratory Experiments:</b>
1.	Determination of the characteristics of a separately excited DC generator.
2.	Determination of the characteristics of a DC motor
3.	Study of methods of speed control of DC motor
4.	Determination of the characteristics of a compound DC generator (short shunt)
5.	Determination of speed of DC series motor as a function of load torque.
6.	Polarity test on a single phase transformer
7.	Determination of equivalent circuit of a single phase transformer and efficiency.
8.	Study of different connections of three phase transformer.
9.	Study of Parallel operation of a single phase transformers.
10.	Determination of temperature rise and efficiency of the transformer.(Back to back test)

**Course Outcome:**

After completion of this course, the learners will be able to

1. identify appropriate equipment and instruments for the experiment.
2. test the instrument for application to the experiment.



**Maulana Abul Kalam Azad University of Technology, West Bengal**

*(Formerly West Bengal University of Technology)*

**Syllabus for B. Tech in Electrical Engineering**

(Applicable from the academic session 2018-2019)

3. construct circuits with appropriate instruments and safety precautions
4. validate different characteristics of DC machine , methods of speed control of DC motor and parallel operation of the transformer
5. work effectively in a team

Special Remarks: The above-mentioned outcomes are not limited. Institute may redefine outcomes based their program educational objective.

# Hooghly Engineering & Technology College



Field Project with vocational training

(2018-2023)

Date - 12/08/2022

# CERTIFICATE OF COMPLETION

This Certificate is proudly presented to

**SOUVIK SARKAR**

Req. No.-023264 of 2019-20

Dept. of Civil Engineering.

Hooghly Engineering & Technology College

in recognition of his hardwork and dedication in completing the training from 04/07/2022 to 05/08/2022 at PHE Dte. Under GBC Infrastructure Pvt. Ltd.



*S.K. Saha*

Site-Incharge  
GBC Infra. Pvt. Ltd.

*S. Saha*  
12/08/22

Executive Engineer  
PHE Dte.

ENGINEERS & CONTRACTORS ESTD. 1834. BUILDING A NEW HERITAGE

**MACKINTOSH BURN LIMITED**

(A Government of West Bengal Enterprise)

CIN : U45201WB1913SGC0002377



MBL HOUSE, DD-10/8, Sector - I, Salt Lake City, Kolkata - 700 064,  
Phone : (033) 2358-1418, 2358-1420, 2337-1654, 2337-1657,  
2359-2845, 2359-3088, 9073909050 Fax No. : 91-33-2334-7415,  
E-mail : mdmb12018@gmail.com, mb1sl@mackintoshburn.net

Ref no: 157997

Date: 18.08.2022

**TO WHOM IT MAY CONCERN**

This is to certify that **Ms. Arunwita Bera, Civil Engineering**  
Student of **Hooghly Engineering & Technology College** has undergone  
**Vocational Training** for the period from **04.07.2022 to 03.08.2022** on '**No**  
**Payment**' basis. As reported by the site in charge, the Performance of **Ms.**  
**Arunwita Bera** during the period of training is found satisfactory.

Yours faithfully,

For MACKINTOSH BURN LIMITED

  
S. Das

(O.S.D/Personnel Dept)

MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL  
(Formerly Known as West Bengal University of Technology)



Lab 1

Attendance Sheet For CA4 : 2023-24

HOOGHLY ENGINEERING &amp; TECHNOLOGY COLLEGE

(176)

Bachelor of Technology in Civil Engineering (013) SEM-3

SUBJECT NAME : Engineering Mechanics - CE(ES)301

Attendance Sheet For : CA4

Name of Teacher : Tanumoy Ghosh

Sr. No.	Roll No./ NAME	Signature
1	17601322001 - INDRAJIT DAS	Indrajit Das
2	17601322002 - KRISHNENDU ADAK	Krishnendu Adak
3	17601322003 - SUSOVAN MAITY	Suovan Maity
4	17601322004 - SHAKYASINGHA DAS	Shakya Singha Das
5	17601322005 - SHUBHA GHORUI	Shubha Ghorui
6	17601322007 - SUMAN NATH	Suman Nath

*Tanumoy Ghosh*  
Signature of the Subject Teacher



GOVERNMENT OF WEST BENGAL  
OFFICE OF THE ASSISTANT ENGINEER  
HOOGHLY SUB-DIVISION-I, P.W.D.  
CELL BUILDING, P.D.SEN ROAD, CHINSURAH,  
DIST. - HOOGHLY, PIN - 712101  
Ph: 033-26802855/Mob-9073362617

To Whom It May Concern

*Certifies that Biswajit Koley, a student of 3<sup>rd</sup> Year in Civil Engineering attached to Hooghly Engineering & Technology College, who was allotted for vocational training in Hooghly Sub-Division-I, PWD, under Hooghly Division, PWD, w.e.f. 01.07.2022 to 30.07.2022, in their Academic interest, has successfully completed the training.*

*Performance of the trainee during this period was good. His behavior was also good.*

*I wish his for every success in life.*



*[Signature]*  
18-08-22  
Assistant Engineer, PWD  
Hooghly Sub-Division-I

Date - 12/08/2022 .

# CERTIFICATE OF COMPLETION

This Certificate is proudly presented to

**SOHANA MONDAL**

Reg. No.-201760101320006 of 2020-21

Dept. of Civil Engineering,

Hooghly Engineering & Technology College

in recognition of his hardwork and dedication in  
completing the training from 04/07/2022 to 05/08/2022  
at PHE Dte. Under GBC Infrastructure Pvt. Ltd.



*SK. Saichal*

Site-Incharge  
GBC Infra. Pvt. Ltd.

*Subagis*  
*12/08-22*

Executive Engineer  
PHE Dte.

ENGINEERS & CONTRACTORS ESTD. 1834. BUILDING A NEW HERITAGE

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(A Government of West Bengal Enterprise)

CIN : U45201WB1913SGC002377



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Phone : (033) 2358-1418, 2358-1420, 2337-1654, 2337-1657,  
2359-2645, 2359-3068, 9073909050 Fax No. : 91-33-2334-7415.  
E-mail : mdmb12018@gmail.com, mbisi@mackintoshburn.net

*Ref no: 158007*

*Date: 18.08.2022*

**TO WHOM IT MAY CONCERN**

This is to certify that **Mr. Subhadip Santra Civil Engineering** Student of **Hooghly Engineering & Technology College** has undergone **Vocational Training** for the period from **04.07.2022 to 03.08.2022** on '**No Payment**' basis. As reported by the site in charge, the Performance of **Mr. Subhadip Santra** during the period of training is found satisfactory.

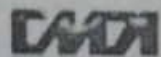
*Yours faithfully,*

*For MACKINTOSH BURN LIMITED*

*S.D M 3/9*  
S.Das

*(O.S.D/Personnel Dept)*





# CERTIFICATE OF COMPLETION

This certifies that

**Soumik Ghosh**

Of

Hooghly Engineering & Technology College

has successfully completed his/~~her~~ **SUMMER VOCATIONAL TRAINING** in

**W & S Sector of**

**KOLKATA METROPOLITAN DEVELOPMENT AUTHORITY**

from 19-07-2022 to 22-08-2022

29 SEP 2022

Date

*Subaidya*

Chief Engineer  
W&S Sector, KMDA

Chief Engineer  
W.&S. Sector  
KMDA

Chief Executive Officer  
KMDA



**Ref no: 158004**

*Date: 18.08.2022*

**TO WHOM IT MAY CONCERN**

This is to certify that **Mr. Gaurav Mishra, Civil Engineering**  
Student of **Hooghly Engineering & Technology College** has undergone  
**Vocational Training** for the period from **04.07.2022 to 03.08.2022** on '**No**  
**Payment**' basis. As reported by the site in charge, the Performance of **Mr.**  
**Gaurav Mishra**, during the period of training is found satisfactory.

*Yours faithfully,*

*For MACKINTOSH BURN LIMITED*

*S.Das*  
3/19

*S.Das*

*(O.S.D/Personnel Dept)*

ENGINEERS & CONTRACTORS ESTD. 1834. BUILDING A NEW HERITAGE

**MACKINTOSH BURN LIMITED**

(A Government of West Bengal Enterprise)

CIN : U45201WB1913SGC002377



MBL HOUSE, DD-18/B, Sector - I, Salt Lake City, Kolkata - 700 064,  
Phone : (033) 2358-1418, 2358-1420, 2337-1654, 2337-1657,  
2359-2645, 2359-3068, 9073909050 Fax No. : 91-33-2334-7415,  
E-mail : mdmbi2018@gmail.com, mbisl@mackintoshburn.net

*Ref no: 157999*

*Date: 18.08.2022*

**TO WHOM IT MAY CONCERN**

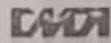
This is to certify that **Mr. Debarghya Barman Civil Engineering** Student of **Hooghly Engineering & Technology College** has undergone **Vocational Training** for the period from **04.07.2022 to 03.08.2022** on '**No Payment**' basis. As reported by the site in charge, the Performance of **Mr. Debarghya Barman**, during the period of training is found satisfactory.

*Yours faithfully,*

For MACKINTOSH BURN LIMITED

S. Das

(O.S.D./Personnel Dept)



## CERTIFICATE OF COMPLETION

This certifies that

**Sauvik Seth**

Of

Hooghly Engineering & Technology College

has successfully completed his/her SUMMER VOCATIONAL TRAINING in

W & S Sector of

**KOLKATA METROPOLITAN DEVELOPMENT AUTHORITY**

from 19-07-2022 to 22-08-2022

29 SEP 2022

Date

Chief Engineer  
W&S Sector, KMDA  
Chief Engineer  
W.&S. Sector  
KMDA

Chief Executive Officer  
KMDA



GOVERNMENT OF WEST BENGAL  
OFFICE OF THE ASSISTANT ENGINEER  
HOOGHLY SUB-DIVISION-I, P.W.D.  
CELL BUILDING, P.D.SEN ROAD, CHINSURAH,  
DIST. - HOOGHLY, PIN - 712101  
Ph.: 033-26802855/Mob-9073362617

To Whom It May Concern

*Certifies that Anirban Das, a student of 3<sup>rd</sup> Year in Civil Engineering attached to Hooghly Engineering & Technology College, who was allotted for vocational training in Hooghly Sub-Division-I, PWD, under Hooghly Division, PWD, w.e.f. 01.07.2022 to 30.07.2022, in their Academic interest, has successfully completed the training.*

*Performance of the trainee during this period was good. His behavior was also good.*

*I wish his for every success in life.*



*By*  
*18-08-22*  
Assistant Engineer, PWD  
Hooghly Sub-Division-I



GOVERNMENT OF WEST BENGAL  
OFFICE OF THE ASSISTANT ENGINEER  
HOOGHLY SUB-DIVISION-I, P.W.D.  
CELL BUILDING, P.D.SEN ROAD, CHINSURAH,  
DIST. - HOOGHLY, PIN - 712101  
Ph.: 033-26802855/Mob-9073362617

To Whom It May Concern

*Certifies that Apurba Mazumder, a student of 3<sup>rd</sup> Year in Civil Engineering attached to Hooghly Engineering & Technology College, who was allotted for vocational training in Hooghly Sub-Division-I, PWD, under Hooghly Division, PWD, w.e.f. 01.07.2022 to 30.07.2022, in their Academic interest, has successfully completed the training.*

*Performance of the trainee during this period was good. His behavior was also good.*

*I wish his for every success in life.*



*[Signature]*  
18-08-22  
Assistant Engineer, PWD  
Hooghly Sub-Division-I

**Government of West Bengal**  
**OFFICE OF THE EXECUTIVE ENGINEER**

HOOGHLY HIGHWAY DIVISION No. - II  
P.W. (ROADS) DIRECTORATE  
PIPULPATI, P.O. - HOOGHLY,  
DIST. - HOOGHLY, PIN NO. -712103  
Ph. No. (033)2680-2443  
E\_mail ID - hhd2\_pwr@hotmail.com.



**পশ্চিমবঙ্গ সরকার**

নির্বাহী বাধুকারের কার্যালয়  
হুগলী সড়ক বিভাগ নং - ২  
পিপুলপাতি, পো : হুগলী, জেলা - হুগলী,  
পিন নং ৭১২১০৩  
দূরভাষ : (০৩৩)২৬৮০-২৪৪৩

**To Whom It May Concern**

This is to certify that Miss **Ayesha Parbin** Registration No: 201760101320046 3<sup>rd</sup> year Civil Engineering student of Hooghly Engineering & Technology Collage, Vivekananda Road, Pipulpati, P.O. & DIST.- Hooghly, Pin- 712103 West Bengal has completed the vocational training during the period from 04.06.2022 to 03.08.2022 under Chandannagar Highway Sub Division under this Division.

During this training period she has attended various work sites of ongoing construction activities like construction of road works and departmental works Chandannagar - Nasibpur Road from 0.00 kmp to 11.62 km Strengthening and Reconstruction of Bridge at chainage 4.60 km in replaced of existing Narrow Bridge.

During training period her performance was satisfactory and I wish her a bright and successful future.

Dated: 25.08.2022



*[Handwritten signature]*  
25.8.22

**Executive Engineer**  
**Hooghly Highway Division-II**  
**P.W.(Roads) Directorate.**



# CERTIFICATE OF COMPLETION

This certifies that

**Keya Pal**

Of

Hooghly Engineering & Technology College

has successfully completed his/her **SUMMER VOCATIONAL TRAINING** in

W & S Sector of

**KOLKATA METROPOLITAN DEVELOPMENT AUTHORITY**

from 19-07-2022 to 22-08-2022

29 SEP 2022

Date

*Subodh*

Chief Engineer  
W&S Sector, KMDA

Chief Engineer  
W.&S. Sector  
KMDA

Chief Executive Officer  
KMDA





# CERTIFICATE OF COMPLETION

This certifies that

**Sanchari Bhattacharya**

Of

Hooghly Engineering & Technology College

has successfully completed his/her **SUMMER VOCATIONAL TRAINING** in

W & S Sector of

**KOLKATA METROPOLITAN DEVELOPMENT AUTHORITY**

from 19-07-2022 to 22-08-2022

29 SEP 2022

Date

Chief Engineer  
W&S Sector, KMDA  
Chief Engineer  
W.&S. Sector  
KMDA

Chief Executive Officer  
KMDA



**Ref no: 158013**

*Date: 18.08.2022*

***TO WHOM IT MAY CONCERN***

This is to certify that **Ms. Shreosi Basu Roy Civil Engineering** Student of **Hooghly Engineering & Technology College** has undergone **Vocational Training** for the period from **04.07.2022 to 03.08.2022** on '**No Payment**' basis. As reported by the site in charge, the Performance of **Ms. Shreosi Basu Roy** during the period of training is found satisfactory.

*Yours faithfully,*

*For MACKINTOSH BURN LIMITED*

*S. Das*  
S.Das

*(O.S.D/Personnel Dept)*



**Ref no: 158005**

Date: 18.08.2022

**TO WHOM IT MAY CONCERN**

This is to certify that *Ms. Jaysree Banik*, **Civil Engineering** Student of **Hooghly Engineering & Technology College** has undergone **Vocational Training** for the period from **04.07.2022 to 03.08.2022** on '**No Payment**' basis. As reported by the site in charge, the Performance of *Ms Jaysree Banik* during the period of training is found satisfactory.

Yours faithfully,

For MACKINTOSH BURN LIMITED

S. Das 3/9

S. Das

(O.S.D./Personnel Dept)



## CERTIFICATE OF COMPLETION

This certifies that

**Sreyam Singh**

Of

Hooghly Engineering & Technology College

has successfully completed his/her **SUMMER VOCATIONAL TRAINING** in

W & S Sector of

**KOLKATA METROPOLITAN DEVELOPMENT AUTHORITY**

from 19-07-2022 to 22-08-2022

**29 SEP 2022**

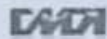
Date

*Sudadya*

Chief Engineer  
W&S Sector, KMDA

Chief Engineer  
W.&S. Sector  
KMDA

Chief Executive Officer  
KMDA



## CERTIFICATE OF COMPLETION

This certifies that

**Subhamaya Sen**

Of

Hooghly Engineering & Technology College

has successfully completed his/her SUMMER VOCATIONAL TRAINING in

W & S Sector of

**KOLKATA METROPOLITAN DEVELOPMENT AUTHORITY**

from 19-07-2022 to 22-08-2022

29 SEP 2022

Date

*Subashya*

Chief Engineer  
W&S Sector, KMDA

Chief Engineer  
W.&S. Sector  
KMDA

Chief Executive Officer  
KMDA



## CERTIFICATE OF COMPLETION

This certifies that

**Sibom Mondal**

Of

Hooghly Engineering & Technology College

has successfully completed his/her SUMMER VOCATIONAL TRAINING in

W & S Sector of

**KOLKATA METROPOLITAN DEVELOPMENT AUTHORITY**

from 19-07-2022 to 22-08-2022

29 SEP 2022

Date

Chief Engineer  
W&S Sector, KMDA

Chief Engineer  
W.&S. Sector  
KMDA

Chief Executive Officer  
KMDA



*Ref no: 157995*

*Date: 18.08.2022*

**TO WHOM IT MAY CONCERN**

*This is to certify that Md Apsar Ali Mallick, Civil Engineering Student of Hooghly Engineering & Technology College has undergone Vocational Training for the period from 04.07.2022 to 03.08.2022 on 'No Payment' basis. As reported by the site in charge, the Performance of Md Apsar Ali Mallick, during the period of training is found satisfactory.*

*Yours faithfully,*

*For MACKINTOSH BURN LIMITED*

*S.Das*  
S.Das

*(O.S.D./Personnel Dept)*



**Ref no: 158010**

*Date: 18.08.2022*

**TO WHOM IT MAY CONCERN**

*This is to certify that Ms. Riya Roy ,Civil Engineering Student of Hooghly Engineering & Technology College has undergone Vocational Training for the period from 04.07.2022 to 03.08.2022 on 'No Payment' basis. As reported by the site in charge, the Performance of Ms. Riya Roy during the period of training is found satisfactory.*

*Yours faithfully,*

*For MACKINTOSH BURN LIMITED*

*S.Das*

*(O.S.D./Personnel Dept)*





**Ref no: 158010**

*Date: 18.08.2022*

**TO WHOM IT MAY CONCERN**

*This is to certify that Ms. Riya Roy ,Civil Engineering Student of Hooghly Engineering & Technology College has undergone Vocational Training for the period from 04.07.2022 to 03.08.2022 on 'No Payment' basis. As reported by the site in charge, the Performance of Ms. Riya Roy during the period of training is found satisfactory.*

*Yours faithfully,*

*For MACKINTOSH BURN LIMITED*

*S.Das*

*(O.S.D./Personnel Dept)*



GOVERNMENT OF WEST BENGAL  
OFFICE OF THE ASSISTANT ENGINEER  
HOOGHLY SUB-DIVISION-I, P.W.D.  
CELL BUILDING, P.D.SEN ROAD, CHINSURAH,  
DIST. - HOOGHLY, PIN - 712101  
Ph.: 033-26802855/Mob-9073362617

To Whom It May Concern

*Certifies that Sanjiban Rudra, a student of 3<sup>rd</sup> Year in Civil Engineering attached to Hooghly Engineering & Technology College, who was allotted for vocational training in Hooghly Sub-Division-I, PWD, under Hooghly Division, PWD, w.e.f. 01.07.2022 to 30.07.2022, in their Academic interest, has successfully completed the training.*

*Performance of the trainee during this period was good. His behavior was also good.*

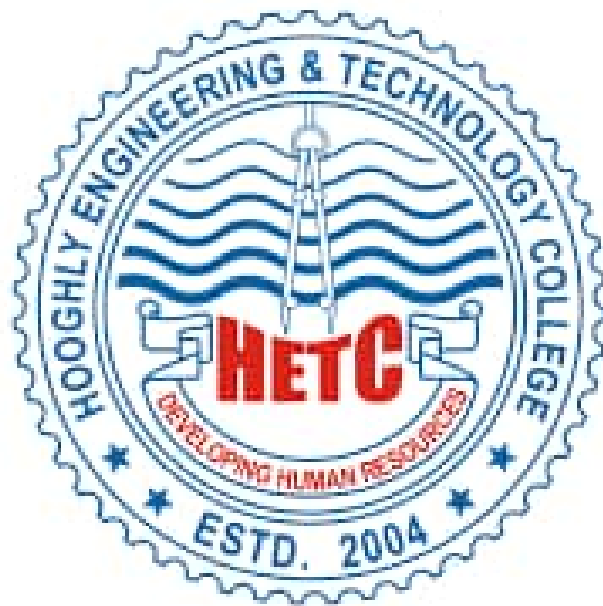
*I wish his for every success in life.*



*[Signature]*  
18-08-22

Assistant Engineer, PWD  
Hooghly Sub-Division-I

# Hooghly Engineering & Technology College



Industrial Visit

DIC CE Dept  
Pls. Clarify following  
Points from students.

1. Where they will visit?
2. Is there any permission from concerned authority or this organization

Registrar  
Pl. give a thought and talk to me.

*[Signature]*  
15/3/19

*[Signature]*  
14/03/19

To,  
The Principal  
(Through the Department-in-Charge)  
Hooghly Engineering and Technology College  
Vivekananda Road, Pipulpati  
P.O. & DIST. - HOOGHLY  
PIN - 712103 (W.B)

SUB: Requesting for "Educational Tour" of Civil Engineering Department

Respected Sir,

With due respect we the students of your institution (Dept. of Civil Engineering), beg to state that we are willing to go to a Technical excursion on 28<sup>th</sup> March and 29<sup>th</sup> March for some applied knowledge enhancement. We think we will be able to gather practical knowledge of various technical fields along with of our books. It will also be beneficial to make a good breakthrough from our indifferent life. So we need your permission and we are quite hopeful about it. It will be our great privilege if you please join us.

Apart from traditional lectures, field visit is one of the most important part of practical knowledge oriented Engineering Education. On this tour we shall observe dam construction, irrigation system, reservoirs, human consumption, industrial usage, hydraulic structures, aquaculture and navigability that we have learnt theoretically in Soil Mechanics, Water Resource Engineering and Fluid Mechanics. We shall also gain the practical knowledge on hydropower which is often used in conjunction with dams to generate electricity and also learn about retaining wall, floodgates, levees etc. The name list of the enthusiastic students' is attached onwards.

We will highly oblige if you allow us to arrange and go to the study tour. Thanking You,

Sincerely yours,  
The Students  
Department of Civil Engineering

14/03/2018

Forwarded to Principal  
A. Chattopadhyay  
14/03/19

Civil 2nd Year.

Name	Roll	Sl. No	Name	Roll
1. Tuskarika Biswas. <del>Tuskarika</del> <sup>Biswas</sup>	1	33	Sanjukta Mitra	15
2. Swarnali Mondal. <del>Mondal</del>	5	34	Piyasha Chakraborty <del>Chakraborty</del>	60
3. Souvik Chakraborty. <del>Chakraborty</del>	10	35	Souvik Ghosh. <del>Ghosh</del>	47
4. Soumi Koley. <del>Koley</del>	12	36	Saiikat Kundu. <del>Kundu</del>	74
5. Sandipan Pramanik. <del>Pramanik</del>	16	37	Anindita Sen. <del>Sen</del>	71
6. Saiikat Jaha. <del>Jaha</del>	17	38	Soyak Mondol. <del>Mondol</del>	53
7. Sabarna Karmakar. <del>Karmakar</del>	18	39	Priyanka Mondol. <del>Mondol</del>	57
8. Rangeta Roy. <del>Roy</del>	19			
9. Namrata Dutta. <del>Dutta</del>	20			
10. Kumar Aman Verma. <del>Verma</del>	22			
11. Ishita Sanyal. <del>Sanyal</del>	24			
12. Indranil Shee. <del>Shee</del>	25	1	Sk. Moineddin. <del>Moineddin</del>	37
13. Bidisha Pal. <del>Pal</del>	28	2	Anindya Hazra. <del>Hazra</del>	03
14. Anirjit Dutta. <del>Dutta</del>	30	3	Rajarshi Karmakar. <del>Karmakar</del>	24
15. Anghya Guha Chakraborty. <del>Chakraborty</del>	31	4	Debankan Kumar Roy. <del>Roy</del>	11
16. Anghyadeep Bhattacharya. <del>Bhattacharya</del>	32	5	Shilpi Biswas. <del>Biswas</del>	39
17. Anrit Manma. <del>Manma</del>	33	6	Utsav Mukherjee. <del>Mukherjee</del>	57
18. Ankan Sarkar. <del>Sarkar</del>	34	7	Sayantu Roychowdhury. <del>Roychowdhury</del>	35
19. Amrita Das. <del>Das</del>	35	8	Ronit Bhadra. <del>Bhadra</del>	27
20. Sowrojoyoti Mukherjee. <del>Mukherjee</del>	41	9	Rohan Karmakar. <del>Karmakar</del>	
21. Sudesha Lodh. <del>Lodh</del>	44	10	Someasur Chakraborty. <del>Chakraborty</del>	
22. Sourav Samanta. <del>Samanta</del>	48	11	Jayasree Sarkar. <del>Sarkar</del>	14
23. Sourav Karsabanik. <del>Karsabanik</del>	49	12	Anindam Kuli. <del>Kuli</del>	06
24. Sourav Biswas. <del>Biswas</del>	50	13	Rajdip Sil. <del>Sil</del>	28
25. Shalu Roy. <del>Roy</del>	52	14	Sourav Ghosh. <del>Ghosh</del>	48
26. Pinaki Mishra. <del>Mishra</del>	61	15	Dippoman Ghosh. <del>Ghosh</del>	13
27. Kuntal Mukherjee. <del>Mukherjee</del>	62	16	Pranjit Koner. <del>Koner</del>	05
28. Debojyoti Roy. <del>Roy</del>	65			
29. Biswarupa Biswas. <del>Biswas</del>	67			
30. Anindita Halder. <del>Halder</del>	69			
31. Sandip Das. <del>Das</del>	54			
32. Sukalyan Dey. <del>Dey</del>	48			

Civil 4th Year.

Civil 3rd Year

Name.	Roll		
1. Biprajit Das <i>Diler</i>	51	33	Diganta Mallik <i>Dull</i> 46
2. Anab Roy <i>Roy</i>	54		
3. Amitava pramanik <i>Apsamanik</i>	71	34	Subhasnil chattarjee <i>chattarjee</i>
4. Soumyadip Sanyal <i>Sanyal</i>	61	35	Ankashorava Roy <i>Roy</i> 55
5. Anab pal <i>APal</i>	69	36	Debita Roy <i>D Roy</i> 47
6. Jewel Rudra <i>Rudra</i>	68	37	Subham Banerjee <i>Banerjee</i>
7. Mainak Kumar <i>Mainak</i>	41	38	Soumyajit Bhattacharjee <i>B</i>
8. Ranjoy patra <i>RPA</i>	29	39	Imbrasil pal <i>I. Pal</i> 44
9. Samapti Banerjee <i>Banerjee</i>	26	40	Tanmoy Mustafi <i>Mustafi</i> 59
10. Ishita Samadder <i>Samadder</i>	43	41	Aniket Banerjee <i>AB</i> 58
11. Ranadeep Das <i>Ranadeep Das</i>	63	42	Bibhas Saha <i>B. Saha</i> 53
12. Raja patra <i>Rajapatra</i>	64	43	Izaz Hossain <i>Izaz Hossain</i> 42
13. Rangad Chakraborty <i>Chakraborty</i>	72	44	Paul Jyotirmoy Paul <i>Paul</i> 67
14. Bittu K. Singh <i>BKSingh</i>	50		
15. Housheer Kumar <i>HK</i>	45		
Sreyan Sanyal <i>Sreyan Sanyal</i>	10		
16. Pratix Mukherjee <i>PM</i>	33		
17. Soumya Banerjee <i>S. B.</i>			
18. Mouinalkanti Fouzdar <i>MK</i>	37		
19. Krishnaam K. Ghosh <i>KKG</i>	66		
20. Debadita Manma <i>DM</i>	49		
21. Md. Shahin Ahmed. <i>SA</i>	38		
22. Suprajit Biswas <i>SB</i>	60		
23. Bigu Das <i>B. Das</i>	52		
24. Sami Chattarjee <i>Shillija</i>	62		
25. Md. Saifuddin <i>Saif</i>	39		
26. Md. Hyderullah <i>H2</i>	40		
27. Priyanka Kumari <i>P. Kumari</i>	31		
28. Debanik Ghosh <i>Debanik</i>	48		
29. Susmita pal <i>S. Pal</i>	5		
30. Pallabi Ghosh <i>Pallabi, Ghosh</i>	65		
31. Anab Mallik <i>A. Mallik</i>	70		

# Link and Picture for Educational Tour of Civil Engineering Department

Link - <https://www.hetc.ac.in/gallery/educational-tour- civil-engg-dept/>







# Hooghly Engineering & Technology College



## Smart Classroom



**Chinsurah, West Bengal, India**  
Hooghly Engineering & Technology College, Vivekananda Rd, Pipulpati Post,  
Hooghly, West Bengal 712103  
Lat 22.893654°  
Long 88.392245°  
01/12/23 10:42 AM GMT +05:30

 **GPS Map Camera**



 GPS Map Camera



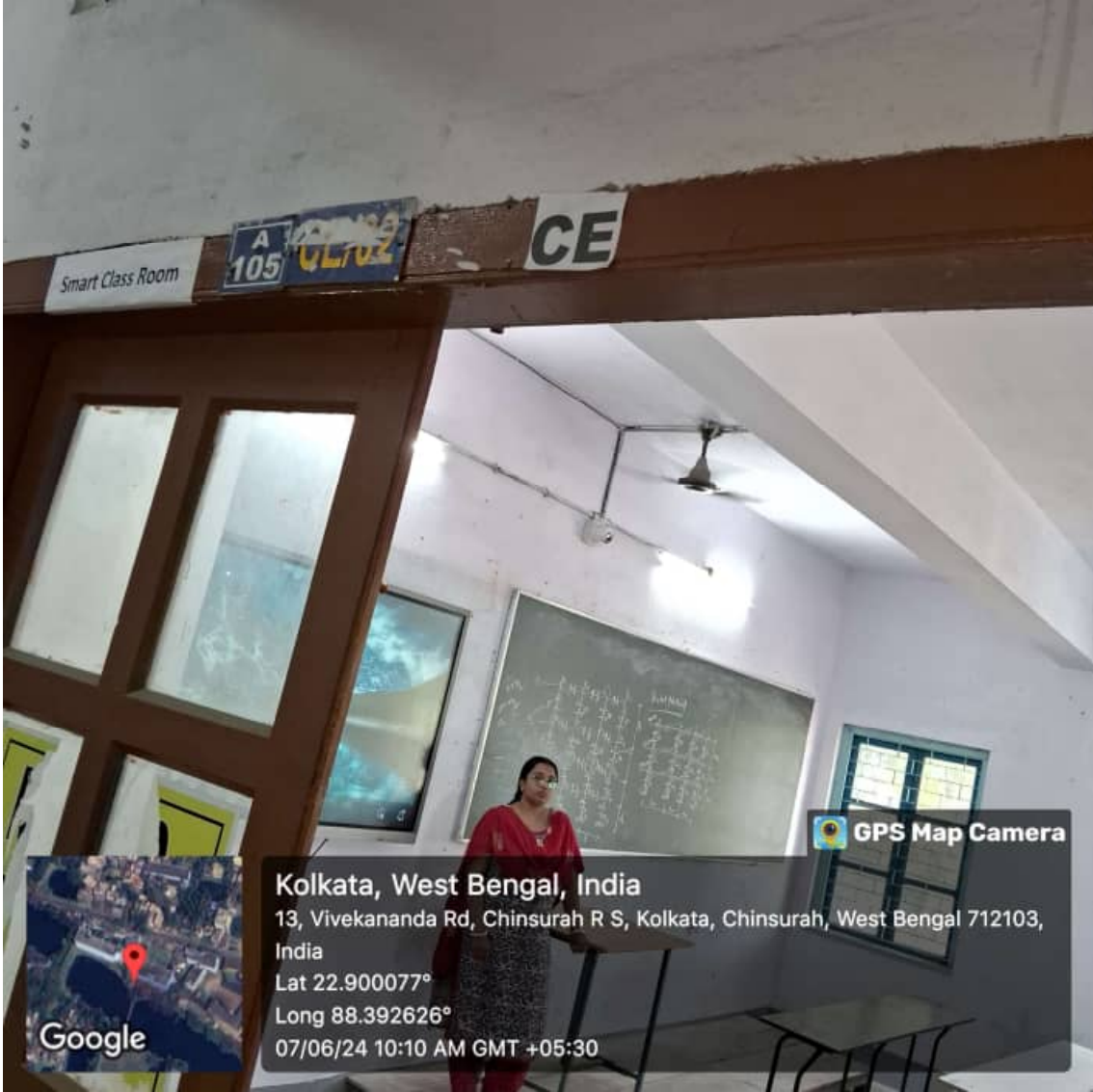
**Kolkata, West Bengal, India**

13, Vivekananda Rd, Chinsurah R S, Kolkata, Chinsurah, West Bengal 712103, India

Lat 22.899935°

Long 88.392575°

31/05/24 12:53 PM GMT +05:30



Smart Class Room

A 105 UL702

CE

GPS Map Camera



Google

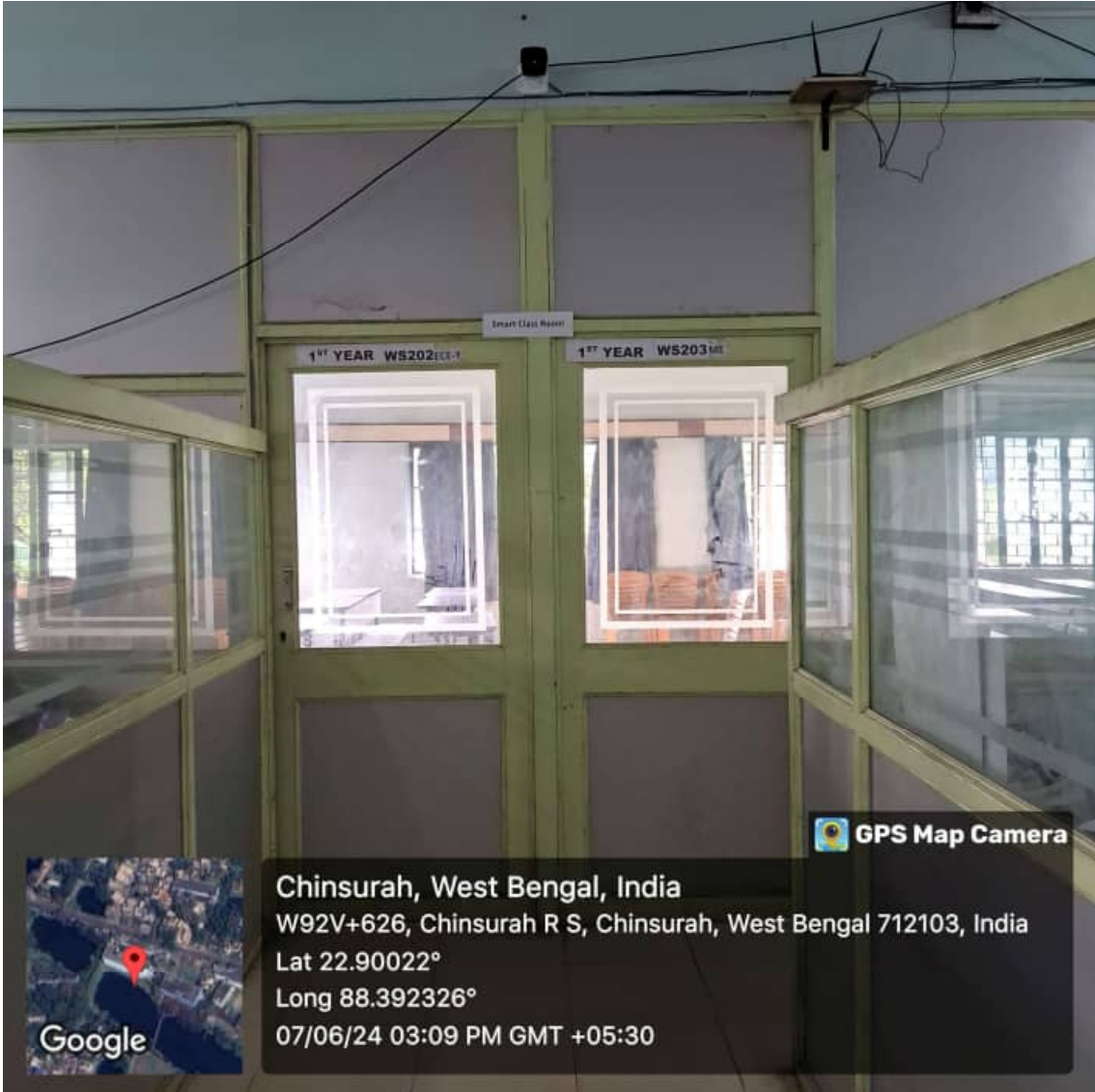
Kolkata, West Bengal, India

13, Vivekananda Rd, Chinsurah R S, Kolkata, Chinsurah, West Bengal 712103, India

Lat 22.900077°

Long 88.392626°


07/06/24 10:10 AM GMT +05:30



Smart Class Room

1<sup>ST</sup> YEAR WS202

1<sup>ST</sup> YEAR WS203

 GPS Map Camera



Google

Chinsurah, West Bengal, India  
W92V+626, Chinsurah R S, Chinsurah, West Bengal 712103, India  
Lat 22.90022°  
Long 88.392326°  
07/06/24 03:09 PM GMT +05:30

# Hooghly Engineering & Technology College



## Project Copy

Final Year Project Report Of

ऐयव वृषिः EYE MATE

Submitted for partial fulfillment of the requirements for the award of the Degree  
of

Bachelor of Technology in  
Electronics and Communications Engineering  
Hooghly Engineering & Technology College

FROM

MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY



Submitted by

DEBJYOTI PAL	17600319036
SAYAR MEEL	17600319006
SONIYA JANA	17600319018
ARKA DATTA	17600319022
SUGATA GHOSAL	17600319014

Under the Supervision of  
PROF. SUBHAJIT ROY, ASSISTANT PROFESSOR

DEPARTMENT OF ELECTRONICS AND COMMUNICATIONS ENGINEERING



HOOGLY ENGINEERING & TECHNOLOGY COLLEGE,  
VIVEKANANDA ROAD, PIPULPATI HOOGLY, PIN NO -712103

SESSION 2022-2023

**Final Year Project Report**

on

**দৈব দৃষ্টি : Eye mate**

Submitted for partial fulfillment of the requirements for the award of the Degree of  
**Bachelor of Technology in Electronics and Communications Engineering**

from

**Maulana Abul Kalam Azad University of Technology, West Bengal**



*Submitted by:*

DEBJYOTI PAL	17600319036
SAYAR MEEL	17600319006
SONIYA JANA	17600319018
ARKA DATTA	17600319022
SUGATA GHOSAL	17600319014

Under the Supervision of:

**Prof. SUBHAJIT ROY, Assistant Professor**

Department of Electronics and Communications Engineering

**Hooghly Engineering & Technology College**



**Vivekananda Road, Pipulpati, Hooghly,**

**West Bengal 712103**

**Session 2022-2023**




**Hooghly Engineering & Technology College**  
**Vivekananda Road, Pipulpati Hooghly, Pin No.-712403**

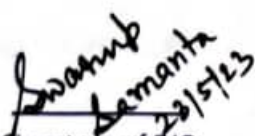



**Department of Electronics and Communications Engineering**

*Certificate*

Certified that the Project Work entitled “**দৈব দৃষ্টি: Eye mate**” is a bonafide work carried out by **Mr. DEBJYOTI PAL (17600319036)**, **Mr. SAYAR MEEL (17600319006)**, **Ms. SONIYA JANA (17600319018)**, **Mr. ARKA DATTA (17600319022)**, and **Mr. SUGATA GHOSAL (17600319014)** in partial fulfillment for the award of Bachelor of Technology in Electronics and Communications Engineering from the Maulana Abul Kalam Azad University of Technology (MAKAUT), West Bengal during the year 2019-2023. It is certified that all the corrections/suggestions indicated for internal assessment have been incorporated in the report deposited in the departmental library. The Project Report has been approved as it satisfies the academic requirements in respect of the Project Work prescribed for the said degree.



  
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## Acknowledgment

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We are thankful to all my teachers at Hooghly Engineering & Technology College who have helped us in many ways throughout the course.

We are thankful to my friends who have helped us in many ways throughout the course and this final year project.

We would like to express my gratitude to our family, and our parents for their forbearance and patience.

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Sugata Ghosal 23.05.23

**A Comparative study of Tribological Behavior of  
Electroless Ni-P, Ni-P-Cu, Ni-P-W coatings.**

*Progress Report*

*Submitted for Partial Fulfillment of the Requirements for the Degree of  
Bachelor of Technology in Mechanical Engineering*

*at the*

**MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY**

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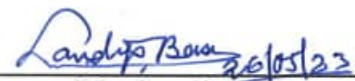
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**MAY -2023**

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26/05/23

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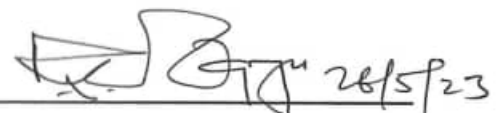
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## ACKNOWLEDGEMENT

The euphoria and joy, accompanying the successful completion of this task would be incomplete without the special mention of those people whose guidance and encouragement made these efforts successful. We have opportunity to express our sincere heartfelt gratitude to my respected guide **Mr. Sandip Basu**, who with zeal encouragement, benevolent and outstanding patience helped us in making these endeavors grand success, his invaluable timely advice, enthusiasm, thought and guidance are reflected on every aspect of this report. I would like to express my gratitude to **Dr. Smitadhi Ganguly**, H.O.D of Mechanical Engineering Department, Hooghly Engineering and Technology College, for his help & continuous encouragement towards project work. I would also like to express my gratitude and thanks to all the respected professors of my department, all the respected staff of my college and my college as a whole. Last but not the least we owe our sincere thanks to all those who helped me in many tangible and intangible ways...

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**Optimal Placement and Rating of Distributed Generator and Capacitor  
Bank in Distribution System using PSO Technique**



MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY  
WEST BENGAL

In partial fulfillment of the requirements for the award of the Degree of  
**BACHELOR OF TECHNOLOGY in Electrical Engineering**

By

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DEPARTMENT OF ELECTRICAL ENGINEERING  
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2021-2022



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Ref. No. ....

Date 16/6/22

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**“Optimal Placement and Rating of Distributed Generator and Capacitor Bank in Distribution System using PSO Technique”**

a project work carried out by **Ms.Shreya Chakraborty (17601618023), Mr. Suvro Snigdho Dutta (17601618012), Ms. Kamini Halder (17601618036), Mr.Souvik Pal (17601618019), and Mr.Rahul Kumar (17601618030)**, in partial fulfillment for the award of Bachelor of Technology in (Electrical Engineering) of the Maulana Abul Kalam Azad University of Technology, West Bengal during the year 2021-2022. It is certified that all the corrections/suggestions indicated for internal assessment have been incorporated in the report deposited in the departmental library. The Project report has been approved as it satisfies the academic requirements in respect of Project Work prescribed for the said degree.

Chandan Jana

Signature of Guide

[Prof.Chandan Jana]

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Smitadhi Ganguly 16/6/22

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4	Sandip Das	<u>Sandip Das</u> 16/06/22
5	Sannistha Banerjee	<u>Sannistha Banerjee</u> 16.6.22

# **An Enhanced Method for Information Hiding Using Cryptography And Steganography**

A project report submitted  
In partial fulfillment of the requirements for the award of the degree of

**Bachelor of Technology**

*In Department of*

**Computer Science & Engineering**

*Submitted By :*

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Shayani Das | University Roll No: 17600118029  
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**Under Guidance of Prof Dibyendu Samanta, Dept. of CSE**

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**Maulana Abul Kalam Azad University of Technology, West Bengal**

MAULANA ABUL KALAM AZAD  
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WEST BENGAL



**Batch : 2018 - 2022**



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It gives us immense pleasure to announce the partial completion of our project on '**An Enhanced Method for Information Hiding using Cryptography and Steganography**' and we are pleased to acknowledge our indebtedness to all the person who directly or indirectly contributed in the development of this work and who influenced our thinking, behavior, and acts during the course of study.

We are thankful to our **DIC Mr. Dibyendu Samanta** who granted all the facilities of the college to us for the fulfillment of our project.

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Finally the team expressed their gratitude to our respected Principal in-charge **Dr. Smitodhi Ganguly** Without his support our project would not have seen the light of success.

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4th year, 8th Semester  
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APPROVED BY AICTE, AFFILIATED TO MAHATMA AND RECOGNIZED BY GOVT. OF W.B., DEPARTMENT OF HIGHER EDUCATION (TECHNICAL)

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This is to certify that the project entitled '**An Enhanced Method for Information Hiding using Cryptography and Steganography**' has been submitted in partial fulfillment of the requirement for the award of the degree of Bachelor of Technology in Computer Science and Engineering by the following B.Tech (CSE) final year students under the supervision of **Mr. Dibyendu Samanta**, Assistant Professor, CSE Department, during a period from September 2021 to June 2022.

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# ABSTRACT

Digital images are being exchanged over various types of networks. With the huge growth of computer networks and the latest advances in digital technologies, a huge amount of digital data is being exchanged over various types of networks. It is often true that a large part of this information is confidential, private or both, which increase the demand for stronger encryption techniques. Steganography is a preferred technique for protecting the transmitted data. It is used to hide information to perform encryption. Steganography techniques are getting significantly more sophisticated and have been widely used. These techniques are the perfect supplement for encryption that allows a user to hide large amounts of information within an image. It seeks to provide a covert communication channel between two parties.

The objective of this project is to provide a secret and secured communication between people. Many different carrier file formats can be used, but digital images are the most popular because of their frequency on the Internet. This project simply hides a text message in an image file. For hiding secret information in images, there exist a large variety of steganographic techniques some are more complex than others and all of them have respective strong and weak points. Different applications have different requirements of the steganography technique used. For example, some applications may require absolute invisibility of the secret information, while others require a larger secret message to be hidden. This project intends to give an overview of cryptography, image steganography, their uses and techniques. In this proposed system Cryptography and Steganography are merged together. The contents of secret message are first kept secret by cryptography; whereas in image steganography the encrypted messages as payload are embedded into the cover image using a novel 3-3-2 LSB. The image steganography takes the advantage of human eye limitation. It uses colour image as cover media for embedding secret message. The important quality of a steganographic system is to be less distortive while increasing the size of the secret message. In this project a method is proposed to embed a colour secret image into a colour cover image. A 3-3-2 LSB insertion method has been used for image steganography.

# Index

Chapter No.	Description	Page No.
1	Introduction	1
2	Literature Review	2
3	System Requirements	5
4	Theoretical Background	6
5	Overview of Cryptography	8
6	Types of Cryptography	9
7	Overview of Steganography	12
8	Types of Steganography	13
9	Proposed Method	19
10	Conclusion	25
11	Future Scope	26
12	References	27

# Chapter 1. Introduction

Steganography is defined as the art and science of writing hidden messages in such a way that no one else, apart from the intended recipient knows the existence of the message. The word “steganography” is basically of Greek origin which means “hidden writing”. The word is classified into two parts: “steganos” which means “secret” and “graphic” which means “writing”. However, in hiding information, the meaning of steganography is hiding text or secret messages into another media file such as image, text, sound, or video. The word “steganography” is often considered similar to “cryptography” and “watermarking”. Whilst watermarking ensures message integrity and cryptography scrambles the message, steganography hides it. The primary objective of steganography is to avoid drawing attention to the transmission of hidden information. If suspicion is raised, then this objective has been planned to achieve the security of the secret message because if the hackers noted any change in the sent message, then this observer will try to know the hidden information inside the message.

The basic terminologies used in the steganography systems are the cover message, secret message, secret key, and embedding algorithm. The particular medium such as text, image, audio, video within which the message is to be hidden is known as cover medium. To provide an extra layer of security, the original message is also changed into some secret message and then it is hidden inside the cover medium. Finally, with the help of embedding algorithm secret message is hidden inside the cover medium.

In steganography, before the hiding process, the sender must select an appropriate message carrier, an effective message to be hidden. A robust steganographic algorithm must be selected that should be able to embed the message more effectively. The sender then may send the hidden message to the receiver by using any of modern communication techniques. The receiver can extract the hidden message using the retrieval algorithm. This project proposes an algorithm to hide data inside an image using a secure steganographic technique.

This project comprehends the following objectives –

1. Original message is converted into a secret message using a strong symmetric key cryptography algorithm.
2. Secret message is hidden inside the color cover image using 3-3-2 LSB insertion technique.
3. To produce security tool based on steganographic techniques.

## Chapter 2. Literature Review

In [1] Shilpa Gupta, Geeta Gujral, and Neha Aggarwal proposed an enhanced approach of LSB steganography where distortion will be almost negligible. Authors are suggested to use 24 bitmap images to hide the secret message. The secret message is to be hidden only in the blue channel. Firstly, all the pixels within the cover image are filtered with a pixel selection filter and then the pixel with less distortion is selected and the LSB of the blue channel of that pixel is replaced by message bits. The proposed method results in a high PSNR value compared to conventional LSB method.

In [2] a new approach for LSB based image steganography using secret key is introduced by S. M. Masud Karim, Md. Saifur Rahman, and Md. Ismail Hossain. In this technique message bits are hidden in LSB of green and blue channel. One by one pixels are selected and XOR operation is performed between LSB of red channel and the first bit of secret message. If result is 0 then LSB of green channel is replaced by the message bit. Otherwise, LSB of blue channel is replaced by the message bit. Then again next bit of secret message and the LSB of red channel of the next pixel is selected and this process continues until the whole message is going to be hidden inside cover image. This method has also a high PSNR value.

In [3] Mamta Juneja, and Parvinder S. Sandhu proposed a new method of hiding message into an image using LSB steganography. Firstly, message is converted into cipher using S-DES algorithm. Now, smooth edges of the cover image are detected by a custom filter composed of Canny filter and Hough transform. Then using a Pseudo Random Number Generator, pixels are selected randomly from the detected smooth edges. Finally, 1 LSB of red channel, 3 LSB of green channel, and 4 LSB of blue channel of the randomly selected pixel is replaced by the bits of the cipher message. This method has a high PSNR value because only smooth edges are slightly changed.

In [4] Marwa M. Emam, Abdelmgeid A. Aly, and Fatma A. Omara introduced a new approach on LSB steganography with random pixel selection. In this approach pixels are selected randomly using a Pseudo Random Number Generator. Channels are selected in a repeated manner of blue-

green and blue channel. In blue channel 2 LSBs, and in green channel only 1 LSB is replaced by the message bit.

In [5] Hamid M. Farhan, and Zena Ahmed Alwan proposed a method of doing LSB steganography by using 2 Exclusive-OR operation. First XOR is performed between LSB of red channel and the first message bit. Then second XOR is performed between result of the first XOR and LSB of green channel. Finally, the LSB of the blue channel is replaced by the result of second XOR. This process continue until the entire message is going to be hidden. This method has a high PSNR as of only  $\pm 1$  change in the blue channel of every pixel.

In [6] Lip Yee Por, Delina Beh, Tang Fong Ang., and Sim Ying Ong proposed a method of steganography by combining stego one, two, three, four-bit LSBs and stego color cycle algorithm. By using color cycle algorithm, pixels are selected sequentially and 1-, 2-, 3-, and 4-bit LSB steganography is applied on each and every channel. The proposed method uses LSB substitution very effectively so that the relative change between RGB channel of stego image is minimal and it uses more secured multi-layered embedding effectively.

In [7] a new method in image steganography with improved image quality is proposed by Atallah M. Al-Shatnawi, where secret messages are hidden within the randomly selected pixels. At first red channel is selected and then two message bits are taken. Then two least significant bits of red channel is taken and it is checked whether they are identical with the message bits or not. If identical then there is no need to hide that two message bits. If not identical then we take next two least significant bits of red channel and again they are checked with the message bits. If the message bits are not identical with any of the two contiguous bits of red channel, then the message bits are replaced with two least significant bits of red channel. Then again next two message bits are selected and this same process is applied on green and blue channel. Also, the hiding locations are saved in a binary table. This whole process is continued until the whole message is going to be hidden inside the cover image. This method has high PSNR value.

In [8] a new encrypted method of image steganography by Sabyasachi Pramanik, Dr. R. P. Singh, Ramkrishna Ghosh where secret messages can be hidden by using the CAPTCHA codes within

a cover image using image steganography. Here the CAPTCHA image is embedded into a 24-bit color image using the LSB of Red, Green and Blue pixels of the 24-bit color image. For each and every character in the captcha a flag bit is set (flag bit is either 0 or 1 depending upon 0 to 1 which have lesser number of occurrences in 7-bit binary ASCII). Now this flag bit is concatenated with the 2-bit binary representation of number of occurrences of flag bit within the ASCII. Finally, this 3-bit binary is converted into decimal and it is concatenated with the positions of flag bit (calculated from left to right started with 1). Now, this final decimal string becomes particular code for that character. Similarly, code is calculated for other characters in the CAPTCHA. Now these codes are converted into binary and they are hidden according to conventional LSB.

In [9], This paper presents a novel 2-3-3 LSB insertion method. The image steganography takes the advantage of human eye limitation. It uses color image as cover media for embedding secret message. The important quality of a steganographic system is to be less distortive while increasing the size of the secret message. In this paper a method is proposed to embed a color secret image into a color cover image. A 2-3-3 LSB insertion method has been used for image steganography. Experimental results show an improvement in the Mean squared error (MSE) and Peak Signal to Noise Ratio (PSNR) values of the proposed technique over the base technique of hash based 3-3-2 LSB insertion.



## Chapter 3. System Requirements

### *Hardware Used:*

**Processor:** Intel Dual Core CPU @ 1.60 GHz

**RAM:** 512 MB of RAM @ 1.60 GHz

**Hard Disk:** 80 GB

### *Software Used:*

**Operating System:** Windows 7 / 8 / 10

**Tool Used:** Python 3

## Chapter 4. Theoretical Background

The term Steganography refers to the art of covert communications. By implementing steganography, it is possible for Alice to send a secret message to Bob in such a way that no-one else will know that the message exists. Typically, the message is embedded within another object known as a cover Work, by tweaking its properties. The resulting output, known as a stegogramme is engineered such that it is a near identical perceptual model of the cover Work, but it will also contain the hidden message.

It is this stegogramme that is sent between Alice and Bob. If anybody intercepts the communication, they will obtain the stegogramme, but as it is so similar to the cover, it is a difficult task for them to tell that the stegogramme is anything but innocent. It is therefore the duty of steganography to ensure that the adversary regards the stegogramme - and thus, the communication - as innocuous.

One of the oldest examples of steganography dates back to around 440 BC in Greek History. Herodotus, a Greek historian from the 5th Century BC, revealed some examples of its use in his work entitled "The Histories of Herodotus". One elaborate example suggests that Histaeus, ruler of Miletus, tattooed a secret message on the shaven head of one of his most trusted slaves. After the hair had grown back, the slave was sent to Aristagorus where his hair was shaved and the message that commanded a revolt against the Persians was revealed. In this example, the slave was used as the carrier for the secret message, and anyone who saw the slave as they were sent to Aristagorus would have been completely unaware that they were carrying a message. As a result of this, the message reached the recipient with no suspicion of covert communication ever being raised.

In modern terms, steganography is usually implemented computationally, where cover Works such as text files, images, audio files, and video files are tweaked in such a way that a secret message can be embedded within them. The techniques are very similar to that of digital watermarking; however, one big distinction must be highlighted between the two. In digital

watermarking, the focus is on ensuring that nobody can remove or alter the content of the watermarked data, even though it might be plainly obvious that it exists.

Steganography on the other hand, focuses on making it extremely difficult to tell that a secret message exists at all. If an unauthorized third party is able to say with high confidence that a file contains a secret message, then steganography has failed.

Steganography also differs from cryptography because the latter does not attempt to hide the fact that a message exists. Instead, cryptography merely obscures the integrity of the information so that it does not make sense to anyone but the creator and the recipient. The adversary will be able to see that a message exists, and the inverse process of cryptanalysis involves trying to turn the meaningless information into its original form. With this said, it is still highly likely that a complete steganographic system might employ cryptographic measures as a safety-net to protect the content of the message in the event that the steganography is broken.

## Chapter 5. Overview of Cryptography

‘Cryptography’ this word is originated from the Greek words ‘kryptos’ meaning hidden and ‘graphein’ meaning writing. So, Cryptography is the practice of hiding messages into secret form and how to retrieve the original one from the secret one. Cryptography and the use of secret codes began thousands of years ago to communicate secretly and securely.

The history of cryptography begins where many old tales do.... in ancient Egypt with hieroglyphics. These were not meant to hide messages so much as to give a formal and ceremonial touch to stories of everyday events. During the industrial age, cryptography was moved from a manual exercise to one done by machines. The invention of cipher disks and rotors for this use allowed for the creation of much more complex algorithms.

Cryptography prior to the modern age was effectively synonymous with encryption, the conversion of information from a readable state to apparent nonsense. The originator of an encrypted message shared the decoding technique needed to recover the original information only with intended recipients, thereby precluding unwanted persons to do the same.

Until modern times cryptography referred almost exclusively to encryption, which is the process of converting ordinary information (called plaintext) into unintelligible text (called cipher text). Decryption is the reverse, in other words, moving from the unintelligible cipher text back to plaintext. A cipher (or cypher) is a pair of algorithms that create the encryption and the reversing decryption. The detailed operation of a cipher is controlled both by the algorithm and in each instance by a "key". This is a secret (ideally known only to the communicants), usually a short string of characters, which is needed to decrypt the cipher text. A "cryptosystem" is the ordered list of elements of finite possible plaintexts, finite possible cipher texts, finite possible keys, and the encryption and decryption algorithms which correspond to each key. Keys are important, as ciphers without variable keys can be trivially broken with only the knowledge of the cipher used and are therefore useless (or even counter-productive) for most purposes.

## Chapter 6. Types of Cryptography

Modern Cryptography is of 3 types.

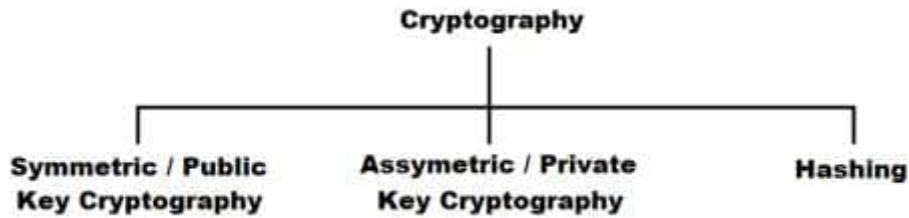


Figure 1. Types of cryptography

a) **Symmetric / Public key cryptography** is a group of cryptographic algorithms where using the same key a message is encrypted on the sender side and decrypted on the receiver side. The encryption and decryption key are same; that is why this is known as public key cryptography. Again, this type of cryptography is divided into two different types. One is block cipher (plain text is divided into fixed or variable length of blocks and encryption is applied on each and every block) and another is stream cipher (a stream of keys is generated and then using them encryption is applied). This was the only kind of encryption publicly known until June 1976. Only agents with the secret key can encrypt or decrypt the data. Some popular symmetric key cryptographic algorithms are AES, DES, etc. An example is given in Figure II.

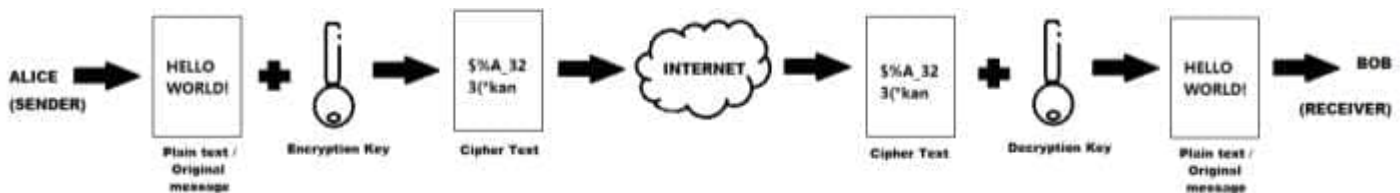


Figure 2. Symmetric/Public key cryptography

b) **Asymmetric / Private key cryptography** is a group of cryptographic algorithms where different keys are used for encryption and decryption process. This is also known as private key cryptography because encryption and decryption keys are not same; rather we can say they are private. A significant disadvantage of symmetric ciphers is the key management necessary to use them securely. Each distinct pair of communicating parties must, ideally, share a different key, and perhaps each cipher text exchanged as well. In a groundbreaking 1976 paper, Whitfield Diffie and Martin Hellman proposed the notion of public-key (also, more generally, called asymmetric

key) cryptography in which two different but mathematically related keys are used—a public key and a private key. A public key system is so constructed that calculation of one key (the 'private key') is computationally infeasible from the other (the 'public key'), even though they are necessarily related. Instead, both keys are generated secretly, as an interrelated pair. Some popular asymmetric key cryptographic algorithms are RSA, Diffie-Hellman, etc. An example is given in Figure III.

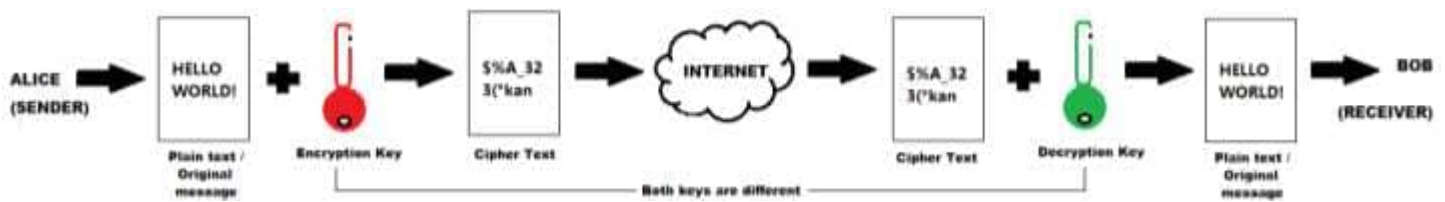


Figure 3. Asymmetric/Private key cryptography

c) **Hashing** is a technique where a mathematical function is taken, generally known as hash function. By applying the hash function plain text is converted into cipher text. A cryptographic hash function is an algorithm that takes an arbitrary amount of data input—a credential—and produces a fixed-size output of enciphered text called a hash value, or just “hash.” That enciphered text can then be stored instead of the password itself, and later used to verify the user.

Certain properties of cryptographic hash functions impact the security of password storage.

Non-reversibility, or one-way function. A good hash should make it very hard to reconstruct the original password from the output or hash.

Diffusion, or avalanche effect. A change in just one bit of the original password should result in change to half the bits of its hash. In other words, when a password is changed slightly, the output of enciphered text should change significantly and unpredictably.

Determinism. A given password must always generate the same hash value or enciphered text.

Collision resistance. It should be hard to find two different passwords that hash to the same enciphered text.

Non-predictable. The hash value should not be predictable from the password. Some popular hashing algorithms are SHA-256, MD5, etc.

A particular cryptographic algorithm from any of the above categories must assure some parameters in order to consider it as a strong algorithm. The parameters are key-length, confusion and diffusion, external factors for system design, etc.

**Cryptanalysis:** Cryptanalysis refers to the process of analyzing information systems in order to understand hidden aspects of the systems. Cryptanalysis is used to breach cryptographic security systems and gain access to the contents of encrypted messages, even if the cryptographic key is unknown.

In addition to mathematical analysis of cryptographic algorithms, cryptanalysis includes the study of side-channel attacks that do not target weaknesses in the cryptographic algorithms themselves, but instead exploit weaknesses in their implementation.

Even though the goal has been the same, the methods and techniques of cryptanalysis have changed drastically through the history of cryptography, adapting to increasing cryptographic complexity, ranging from the pen-and-paper methods of the past, through machines like the British Bombes and Colossus computers at Bletchley Park in World War II, to the mathematically advanced computerized schemes of the present. Methods for breaking modern cryptosystems often involve solving carefully constructed problems in pure mathematics, the best-known being integer factorization.

## Chapter 7. Overview of Steganography

The word 'steganography' originated from the Greek word 'steganographia'. This word was first ever founded in the year 1499 in the book of a Greek author named Johannes Trithemius. This word is basically a combination of two separate words. 'steganos' means hiding or hiding within something and 'graphia' means writing. So, steganography is the practice of hiding messages inside any medium, etc. The particular medium such as text, image, audio, video within which the message is to be hidden is known as cover medium. To provide an extra layer of security, the original message is also changed into some secret message and then it is hidden inside the cover medium. Steganography based communication over easily accessible platforms to prevent leakage of information. Here, embedding of information in a cover image is shown below:

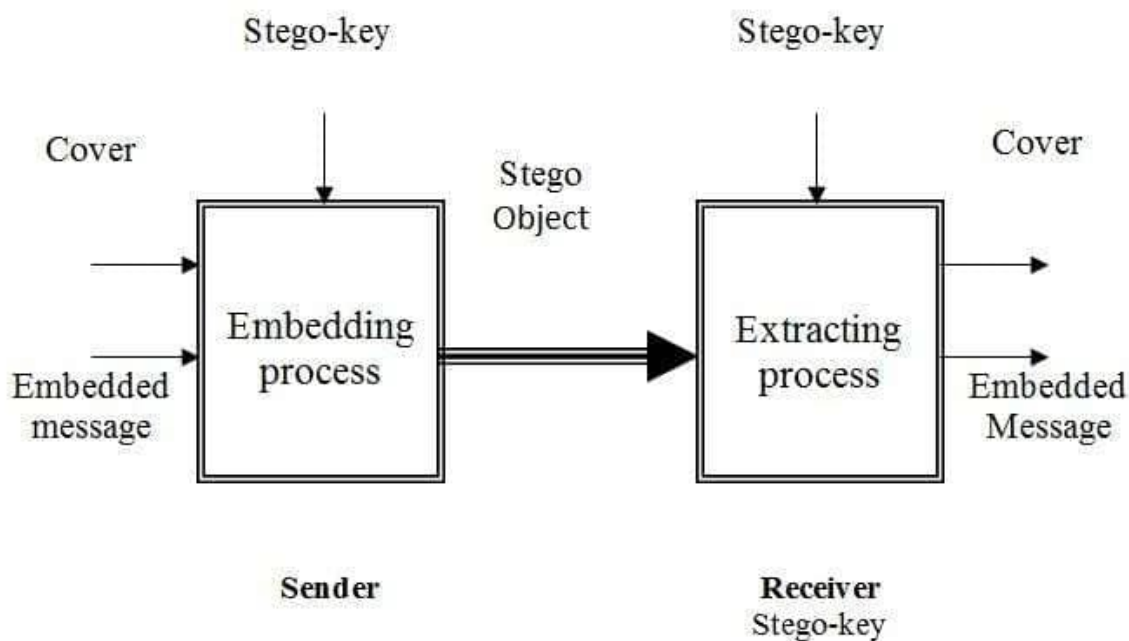


Figure 4. Stego system

Information is added by the sender and if the receiver wants to get the original image, then he needs to extract the embedded image with the help of the secret information provided by the sender. When the receiver will receive the file will be in the embedded form and by extracting it he or she can use or read the original object file which is sent by the sender. This embedding of the binary code is different for the different types of the files.



## Chapter 8. Types of Steganography

Based on the cover medium there are different types of steganography which are given below in the Figure I.

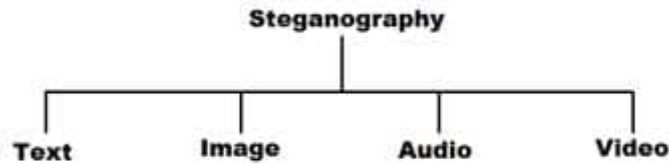


Figure 5. Types of Steganography

In modern steganography, especially digital steganography becomes popular and stand apart from others. In digital steganography, different multimedia files are used to hide the message. Due to the large media file size; it is also hard to find the message within the cover medium. There are several techniques of doing the digital steganography. They are given below in the Figure II

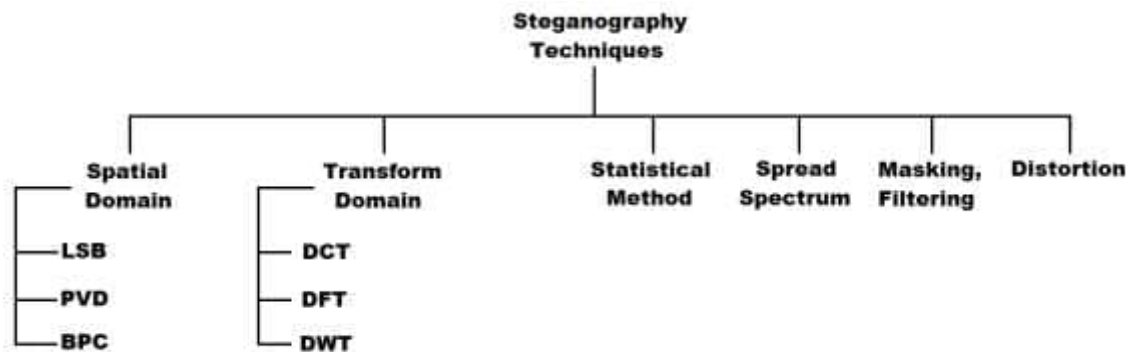


Figure 6. Steganography techniques

Within these techniques, spatial and transform domain techniques are mostly used.

- **Image Steganography:**

a) **LSB** stands for Least Significant Bit steganography. In this technique, least significant bits are replaced with the message bits so that the minimum distortion will be resulted in the cover medium and which is imperceptible to the human eye. In Figure III an example is given.



Figure 7. LSB steganography on Lena image

**b) PVD** stands for Pixel Value Differencing. Two pixels are chosen from the cover medium and it is checked that whether they are belonging to the smooth area or an edge. Then the distortion is calculated by the pixel value difference. Then the message bit is hidden on those pixels.

**c) BPC** stands for Binary Complexity Pattern analysis. In this technique the message bits are changed into binary pattern and then the noisy area of the cover medium is replaced by this pattern. The Human visual system has such a special property that a too-complicated visual pattern cannot be perceived as "shape-informative." For example, on a very flat beach shore every single square-foot area looks the same - it is just a sandy area, no shape is observed. However, if you look carefully, two same-looking areas are entirely different in their sand particle shapes. BPCS-steganography makes use of this property. It replaces complex areas on the bit-planes of the vessel image with other complex data patterns (i.e., pieces of secret files). This replacing operation is called "embedding." No one can see any difference between the two vessel images of before and after the embedding operation.

An issue arises where the data to be embedded appears visually as simple information, if this simple information replaces the complex information in the original image, it may create spurious 'real image information'. In this case the data is passed through a [binary image conjugation transformation], in order to create a reciprocal complex representation.

**d) DCT** stands for Discrete Cosine Transform. In this technique, cover medium like image is transformed into frequency domain from spatial domain. Using this technique, an image is broken into basic images as sinusoidal function. During the process, the secret message is hidden in DCT

coefficients. A discrete cosine transform (DCT) expresses a finite sequence of data points in terms of a sum of cosine functions oscillating at different frequencies. The DCT, first proposed by Nasir Ahmed in 1972, is a widely used transformation technique in signal processing and data compression. It is used in most digital media, including digital images (such as JPEG and HEIF, where small high-frequency components can be discarded), digital video (such as MPEG and H.26x), digital audio (such as Dolby Digital, MP3 and AAC), digital television (such as SDTV, HDTV and VOD), digital radio (such as AAC+ and DAB+), and speech coding (such as AAC-LD, Siren and Opus).

**e) DFT** stands for Discrete Fourier Transform. This is also similar as the previous technique. The discrete Fourier transform (DFT) converts a finite sequence of equally-spaced samples of a function into a same-length sequence of equally-spaced samples of the discrete-time Fourier transform (DTFT), which is a complex-valued function of frequency. The interval at which the DTFT is sampled is the reciprocal of the duration of the input sequence.

**f) DWT** stands for Discrete Wavelet Transform. It is any wavelet transform for which the wavelets are discretely sampled. In this technique the high and low frequency regions of an image is detected and based on it the message is hidden in a particular portion which results in a minimum distortion. As with other wavelet transforms, a key advantage it has over Fourier transforms been temporal resolution: it captures both frequency and location information (location in time).

These all techniques are used to implement steganography but not directly. Some algorithm is used with these techniques to make it stronger and variant. These steganographic algorithms must assure some parameters like PSNR (Peak Signal to Noise Ration), MSE (Mean Squared Error), imperceptibility, bit error rate, robustness, etc. to make sure that it is a secure algorithm.

- **Audio Steganography:**

In audio steganography, secret message is embedded into digitized audio signal which result slight altering of binary sequence of the corresponding audio file. There are several methods are available for audio steganography. Some of them are as follows –

a) **Phase coding** is a scheme where the phase of carrier file is replaced with reference phase which represents hidden data. In parity coding signals are divided into regions, then parity bit of each region calculated and matched with secret message bit. Depending on parity matching result encoding is done.

b) **Spread spectrum** technique spreads hidden data through the frequency spectrum. Spread spectrum (SS) is a concept developed in data communications to ensure a proper recovery of a signal sent over a noisy channel by producing redundant copies of the data signal. Basically, data are multiplied by an M-sequence code known to both sender and receiver, then hidden in the cover audio. Thus, if noise corrupts some values, there will still be copies of each value left to recover the hidden message. In conventional direct sequence spread spectrum (DSSS) technique was applied to hide confidential information in MP3 and WAV signals. Spread spectrum is combined to phase shifting in order to increase the robustness of transmitted data against additive noise and to allow easy detection of the hidden data. Appropriately chosen sub-band coefficients were selected to address robustness and resolve synchronization uncertainty at the decoder.

c) **Tone coding** focuses on the frequency masking in audio by using tone insertion method. Inserting tones at known frequencies and at low power level (depends on the original audio power) then modulate the secret message into this inserted tone. The hidden information is imperceptible so a listener is unable to distinguish between the cover- and the stego-audio signal. So, the cover is audio and the hidden data (secret message) is the English language text document. The proposed method focuses on the payload of the host audio with no disruption of robustness and imperceptible. The payload has been increased using new algorithm relay on new stego-table and using frequent pattern detection into ANSI code.

Also, there are other techniques like Wavelet coefficient, low bit encoding, echo coding, etc.

- **Text Steganography:**

Text steganography is a mechanism of hiding secret text message inside another text as a covering message or generating a cover message related with the original secret message. There are three

main categories used to hide text-in-text messages, that is, format based, random, and statistical generations and linguistic method.

- **Video Steganography:**

Video steganography comprises two procedures which are the embedder and detector. The embedder has two data sources, which are payload implying the amount of secret message inserted inside a cover, and the cover video is utilized as a cover that contains the message inside it. Most methods of steganography implement the hiding operation on the cover without selecting better pixels. The correct selecting of pixels for hiding data achieves a high quality and robustness. Steganography has many techniques to hide the information. One of them is the least significant bit (LSB) method. The main disadvantages of this technique are the serial selection of pixels within the frame that is used for embedding the information inside it and the weakness against electronic attacks. For this reason, the knight tour algorithm was utilized for random selection of pixels and also a key function encryption method used to encrypt a secret message to increase the security and the robustness for the proposed method. After that, the stego video is made as an outcome of the embedding process and will be sent to the recipient. The detector represents the second procedure where the stego video represents the input to this procedure, and the detector can find the secret message by utilizing an extraction procedure.

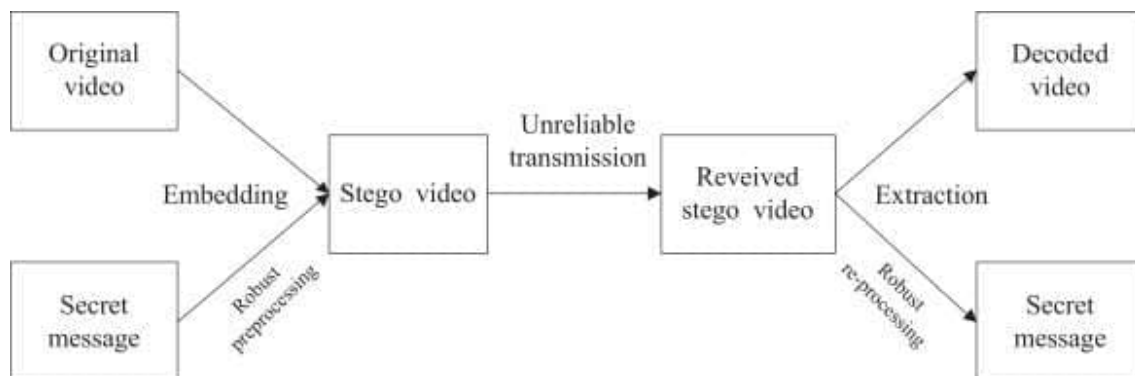


Figure 8. Video steganography flowchart

- **IP datagram steganography:**

This is another approach of steganography, which employs hiding data in the network datagram level in a TCP/IP based network like Internet. Network Covert Channel is the synonym of

network steganography. Overall goal of this approach to make the stego datagram is undetectable by Network watchers like sniffer, Intrusion Detection System (IDS) etc. In this approach information to be hide is placed in the IP header of a TCP/IP datagram. Some of the fields of IP header and TCP header in an IPv4 network are chosen for data hiding.

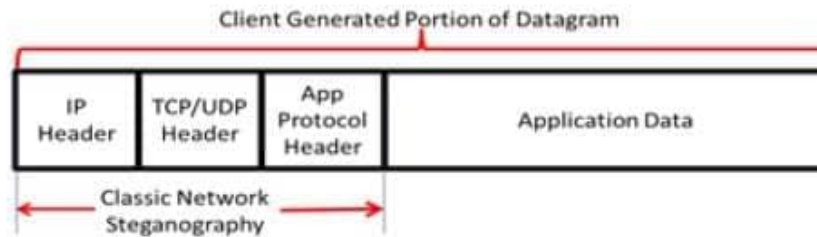


Figure 9. IP Datagram steganography

**Steganalysis:** Steganalysis is the process of identifying steganography by inspecting various parameter of a stego media. The primary step of this process is to identify a suspected stego media. After that steganalysis process determines whether that media contains hidden message or not and then try to recover the message from it.

The goal of steganalysis is to identify suspected packages, determine whether or not they have a payload encoded into them, and, if possible, recover that payload.

Unlike cryptanalysis, in which intercepted data contains a message (though that message is encrypted), steganalysis generally starts with a pile of suspect data files, but little information about which of the files, if any, contain a payload. The Steg analyst is usually something of a forensic statistician, and must start by reducing this set of data files (which is often quite large; in many cases, it may be the entire set of files on a computer) to the subset most likely to have been altered.

## Chapter 9. Proposed Method

In this proposed system Cryptography and Steganography are merged together. The system first encrypts the secret message by using a very simple Symmetric Key Cryptography Algorithm by using the private key K generated by a key generating algorithm. Then in the second step, the secure encrypted secret message (ciphertext) is hidden as a payload inside the cover image by using a novel technique using the 3-3-2 LSB insertion method. For retrieval of the hidden message, the same reverse technique will be applied. The proposed system first generates the private key K and then encrypts the secret message in the first step.

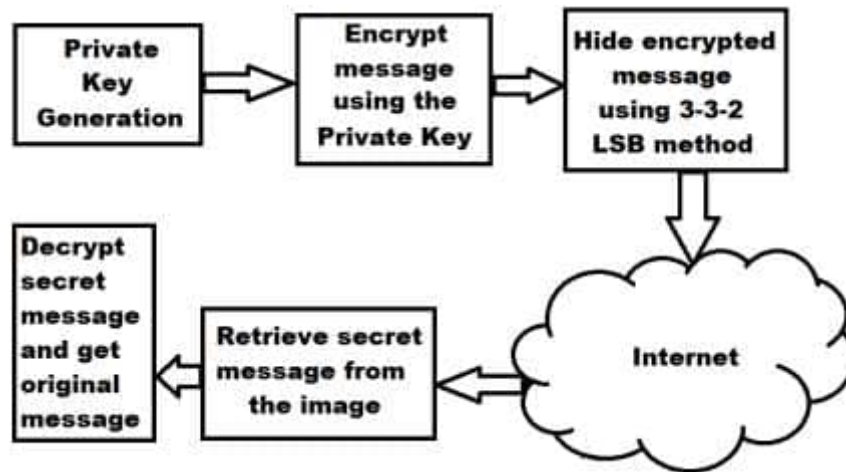


Figure 10. Proposed method process diagram

- **Private Key generation algorithm:**

1. Find the length  $n$  of the string.
2. Generate a random number between 1 to  $n$ .
3. Go to the  $r^{\text{th}}$  character of the string.
4. Get the ASCII value for the  $r^{\text{th}}$  character and generate the 8-bit equivalent binary value.
5. Select the 4-digit key (value must be greater than or equal to  $(1000)_2$  or 8) as  $K$  from the first 4 bit of the binary value. If the condition is not satisfied then move for the next 4 bits and do the same check again.
6. If  $K$  not found from the previous steps, then repeat the same process from step 1 to step 5.

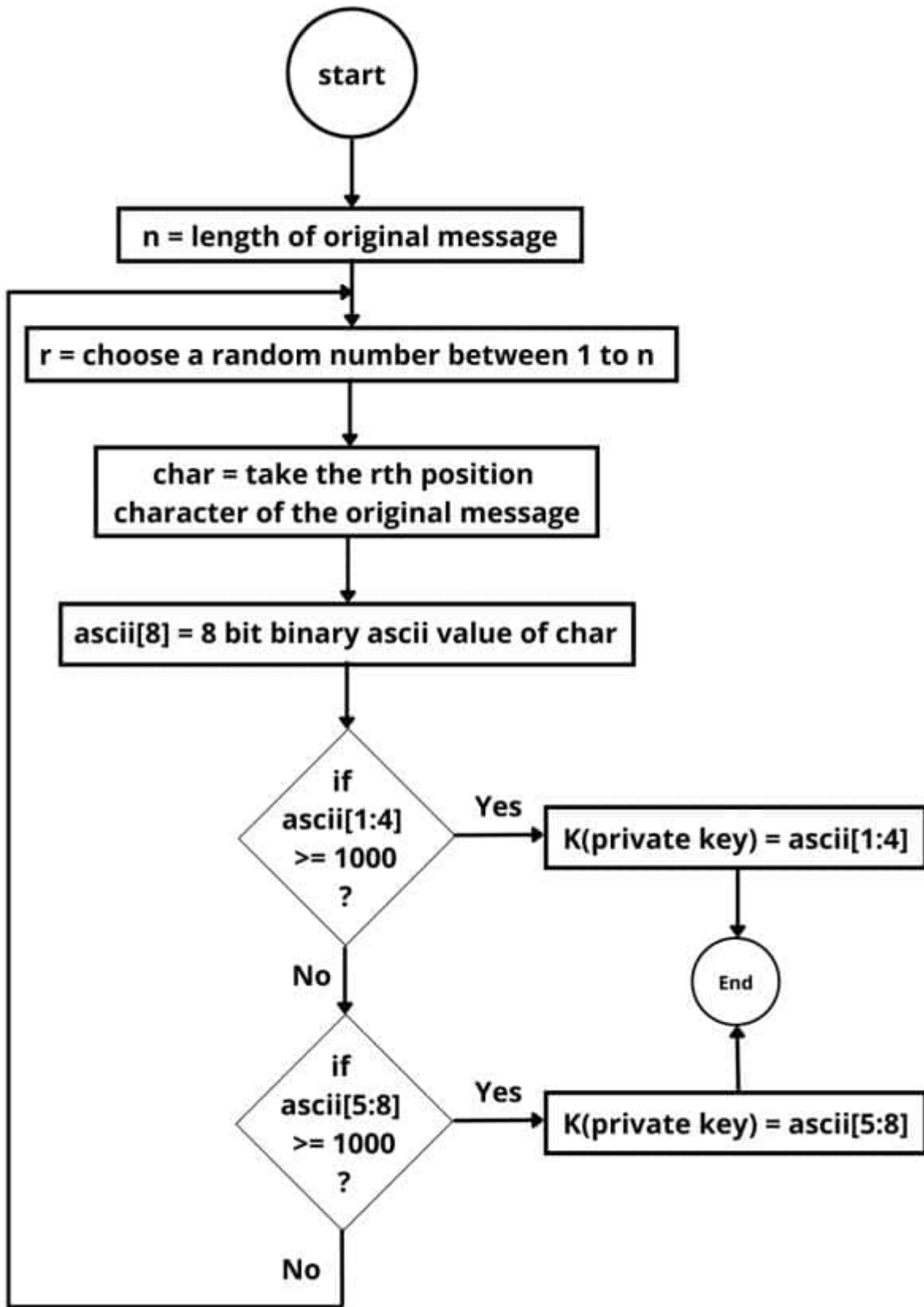


Figure 11. Private key generation flowchart



- *Symmetric Key cryptography algorithm:*

- *Encryption Algorithm:*

1. Generate the ASCII value of all the letters.
2. Divide all the values with K.
3. Store the quotient as 4 MSB bits and remainder as 4 LSB bits. Represent both quotient and remainder in 4-bit binary representation.
4. Reverse all the 8-bit binary number(s).
5. Now the resultant binary set of numbers after the above operations is the secret encrypted cipher text, ready to use for second step.

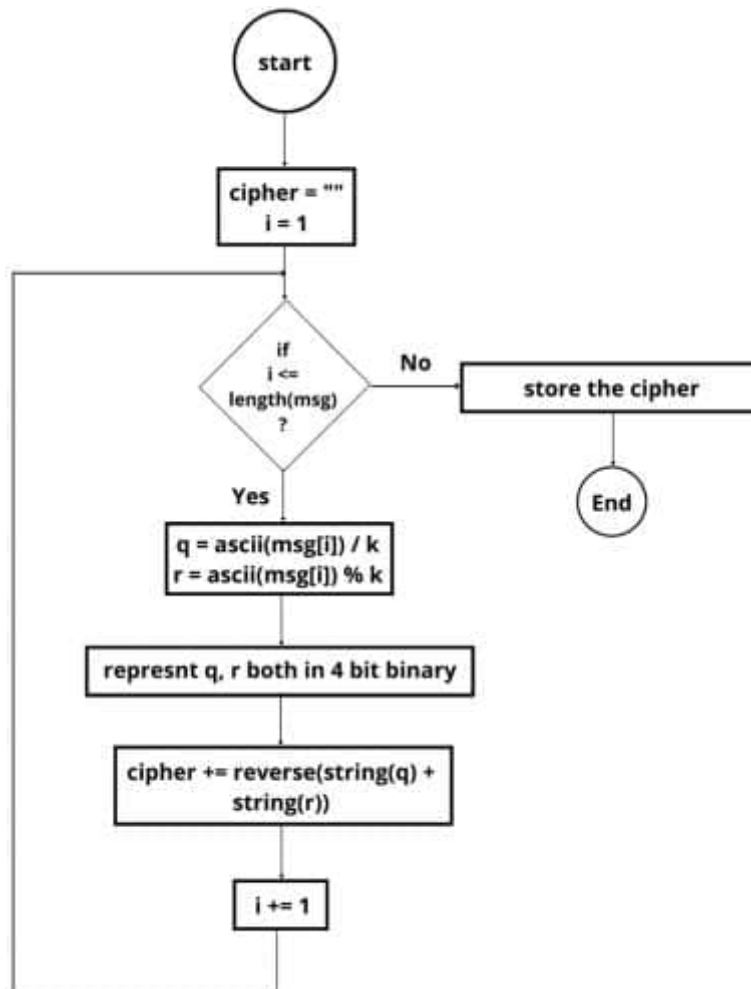


Figure 12. Encryption flowchart

- ***b) Decryption Algorithm:***

1. Reverse all the 8-bit numbers of H.
2. Multiply 4 MSB bits of all the cipher text by the Key K.
3. Add 4 LSB bits of the cipher text with the result produced in the previous step.
4. If the result produced in the previous step is not an 8-bit number we need to make it an 8-bit number by adding 0s (Zeros) in left hand side.
5. All the numbers in 8 bits become the original text i.e. The Plain Text or Secret Data.

A hash based least significant bit technique is proposed in this paper. A color image is considered as a cover media and secret data is embedded in this cover media as payload. The proposed technique takes eight bits of secret data at a time and put them in LSB of RGB (Red, Green and Blue) pixel value of the cover image in 3-3-2 order respectively. Such that 3 pixels are embedded in red channel, 3 pixels are embedded in green channel, and 2 pixels are embedded in blue channel.

Suppose 240 is value of secret message and its equivalent 8 binary value is 11110101; then it is distributed in the order of 3-3-2 to be embedded in LSB of RGB pixels respectively. Suppose  $m$  represents the bit position within the pixel. Value of  $m=1,2,3$  for red,  $m=4,1,2$  for green, and  $m=3,4$  for blue. So, after embedding the secret data in the particular pixel of cover image, The RGB pixel value of the stego image as below – Red (00100111), Green (11101010), Blue (11001000)

The embedding positions of the eight bits out of the four (4) available bits of LSB is obtained in a cyclic order which increases the security of the technique compared to other LSB based techniques.

# 3-3-2 LSB Encryption

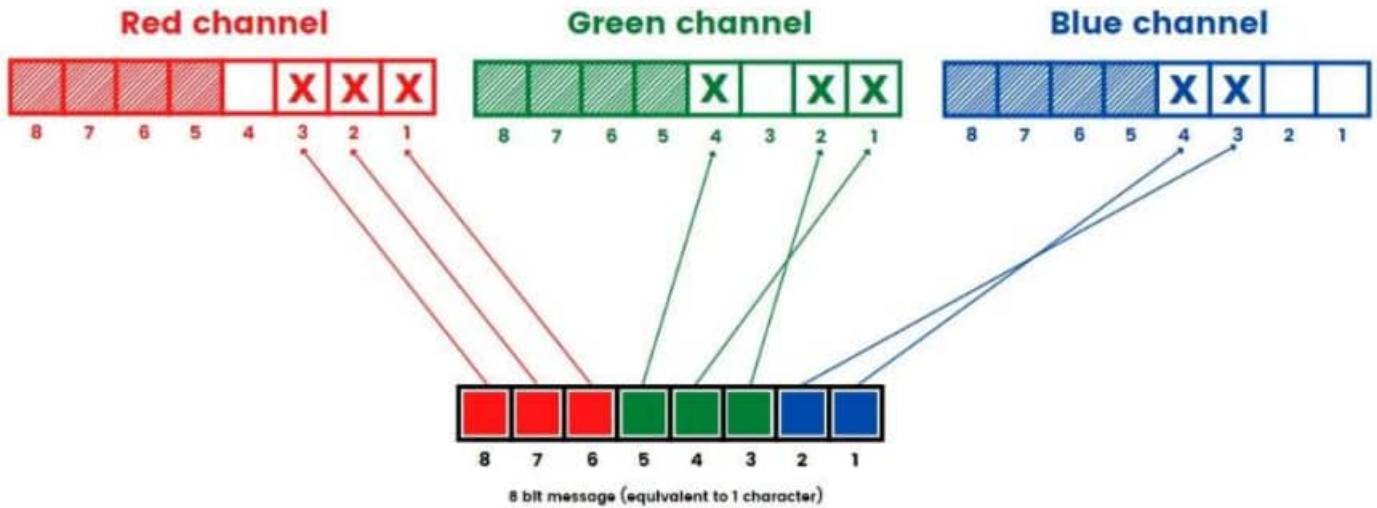


Figure 13. 3-3-2 LSB Encryption technique

After embedding secret image in the cover image, it will become a stego image. The intended user follows the reverse steps to retrieve the secret data. The proposed 3-3-2 algorithm, for encoding and decoding are given in this section. Encoding technique and the decoding technique is given below.

- **Algorithm of Encoding:**

1. Input cover image file
2. Read required secret image file to be hidden
3. Read a stego key and generate row index  $r$  and column index  $c$  from the stego key.
4. Reserve last two pixels for sending the stego key and length of the string.
5. Embed the message bit from the pixel with row index  $r$  and column index  $c$ .
6. Take 4 LSB bits of each red, green, blue pixels of the cover image.
7. Compute the position for inserting the secret data into cover image in a cyclic order

8. Embed the eight bits of the secret image into 4 bits of LSB of RGB pixels of the cover image in the order of 3,3,2 respectively using the position obtained from step 7.
9. Repeat steps 6 to 8 until all pixels of secret image are embedded in cover image.

- ***Algorithm of Decoding:***

1. Input stego image file
2. Extract the stego key and length of the string from the image.
3. Store the number of message bits in the variable remaining.
4. Find the row index  $r$  and column index  $c$  from the stego key.
5. Retrieval will be started from the pixel with row index  $r$  and column index  $c$ .
6. Take 4 LSB bits of each red, green, blue pixels of the stego image.
7. Obtain the position of embedded bits of the secret data in a cyclic order.
8. Retrieve the bits using these positions in the order of 3,3,2 respectively, using the position obtained from step 7.
9. Reconstruct the secret information.
10. Repeat steps 3 to 5 until all pixels of secret image embedded are retrieved.

## **Chapter 10. Conclusion**

The proposed technique is a highly secure technique for embedding messages into images. Also, the symmetric key cryptographic algorithm used in this approach is very strong as it uses 8 bits key and a complex enciphering algorithm. It is almost computationally infeasible to retrieve the original message with a plain text attack. This technique also results in less distortion in an image after embedding. It has high PSNR (Peak Signal to Noise Ratio), less MSE (Minimum Squared Error), and it is imperceptible. This technique is also better than conventional LSB steganography. In this way, the system was strengthened using LSB approach to provide a means of secure communication.

The strength of Steganography lies in the sheer amount of information that changes hands every day. It is very simple using digital technology to conceal any given digital information within other information, so virtually anything could contain a hidden meaning. There is no practical way to check it all. However, none of steganography methods we examined could resist a concerted attack if someone knew that there was a message in a given document. For the greatest level of secrecy, a combination of both steganography and cryptography is necessary.

## **Chapter 11. Future Scope**

1. A strong cryptosystem can be built from the proposed method.
2. A stronger cryptographic technique can be applied with the proposed steganographic technique in order to increase the security.
3. Instead of single or double level; multilevel encryption can be applied with this technique to make the proposed method more secure.

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**MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY**



**A PROJECT REPORT ON  
PLANNING, ANALYSIS & DESIGN OF  
A TEN-STORED RESIDENTIAL BUILDING**

**SUBMITTED PARTIAL FULFILLMENT  
REQUIREMENT FOR THE AWARD OF THE DEGREE  
OF  
BACHELOR OF TECHNOLOGY  
IN  
CIVIL ENGINEERING**

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**UNDER THE ABLE GUIDANCE OF  
Prof. Shibasish Deb  
(Assistant Professor, Civil Engineering Department)  
(2020-2021)**



**HOOGLY ENGINEERING AND TECHNOLOGY COLLEGE**




## CERTIFICATE


This is to certify the project entitled "PLANNING, ANALYSIS & DESIGN OF A NINE-STORIED RESIDENTIAL BUILDING" in partial fulfilment of the award of the degree of Bachelor of Technology in the field of Civil Engineering under MAULANA ABDUL KALAM AZAD UNIVERSITY OF TECHNOLOGY is the bonafied

Representation of the work carried out by, PRIYAM GHOSH


Under the guidance of Prof. Shibasish Deb. Assistance Professor, Department of Civil Engineering. HOOGHLY ENGINEERING AND TECHNOLOGY COLLEGE.

  
12/06/22

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Dr. Smitadhi Ganguly  
(Principal in Charge. HETC)

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# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY

MAULANA ABUL KALAM AZAD  
UNIVERSITY OF TECHNOLOGY,  
WEST BENGAL.



A PROJECT REPORT ON  
PLANNING, ANALYSIS & DESIGN OF  
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SUBMITTED IN PARTIAL FULFILMENT  
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UNDER THE GUIDANCE OF  
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(TO WHOM IT MAY CONCERN)

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Principal

## ACKNOWLEDGEMENT

First and foremost, I would like to express my sincere gratitude to my supervisor **Prof. Shibasish Deb**, without whom completion of this project could not have been possible. His thorough support, guidance, suggestions, encouragement and advice made it easy for me to carry on the project successfully.

I am extremely grateful to **Prof.(Dr.) Tanumoy Ghogh**, Head of the Department, of Civil Engineering Department, for giving me the opportunity to complete the project and for providing the necessary facilities.

I am thankful to my batch mates who helped me with their valuable suggestions time to time.

Last but not the least, I would like to convey my gratitude towards family and friends for being a great support and motivating me during the course of this project.

*Sujit Mitra*  
Sujit Mitra.

University Roll No: 17601320052

University Registration No: 201760101320013

*Sayani Mitra*  
Sayani Mitra.

University Roll No: 17601320055

University Registration No: 201760101320010

*Sohana Mondal*  
Sohana Mondal.

University Roll No: 17601320059

University Registration No: 201760101320006

*Puja Mallick*  
Puja Mallick.

University Roll No: 17601320064

University Registration No: 201760101320001

# Hooghly Engineering & Technology College



Conference, Webinar, Seminar

(2018-2023)



# Hooghly Engineering and Technology College

Approved by AICTE, Recognize by UGC, Affiliated to MAKAUT (Formerly WBUT)  
Vivekananda Road, Pipulpati, P.O. & Dist. Hooghly, Pin 712103 West Bengal

## 3-Day State Level Workshop on Advanced Surveying Using DGPS and Total Station, 28-30<sup>th</sup> March 2023

### Brochure

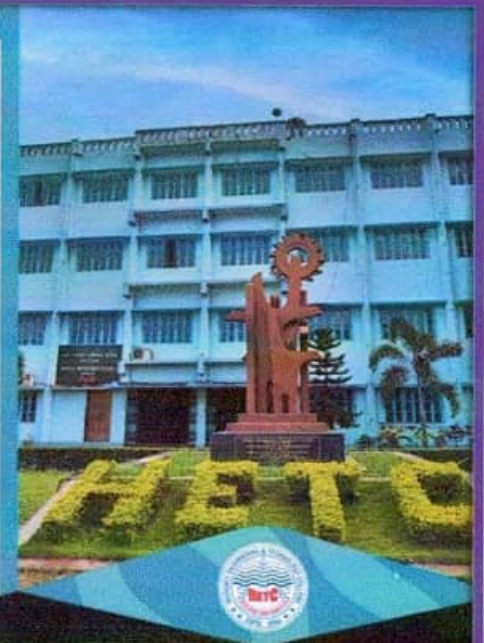
#### Hooghly Engineering & Technology College About HETC

Hooghly Engineering and Technology College (HETC) is a self-financed engineering college run by the Hooghly Engineering & Technology College Society, promoting technical education amongst students and disseminating scientific knowledge in society. The institute is affiliated with the Maulana Abul Kalam Azad University of Technology (formerly WBUT). The Government of West Bengal recognizes it, and the All India Council for Technical Education (AICTE) approves its courses. HETC is in Hooghly of Hooghly district in West Bengal, India. It is 19 km (12 miles) from the Hooghly railway station and approximately 800 m (2,600 ft) from the Hooghly Ghat railway station. Hooghly Engineering and Technology College offers undergraduate programs in engineering disciplines. The College provides B.Tech in Civil Engineering, Computer Science and Engineering, Electronics and Communication Engineering, Electrical Engineering, and Mechanical Engineering. The institution is committed to promoting research and providing quality education through its dedicated management, faculty, and staff members. HETC has grown into one of West Bengal's leading educational institutes within 38 years by offering various stimulating environments for its stakeholders' intellectual development, free-thinking, and personal growth. The motto of HETC is to challenge students with dynamic learning opportunities and provide them with the skills, insights, attitudes, and practical experiences required to take up societal responsibilities. With so much to offer, it's only natural that HETC students have a one-of-a-kind opportunity to carve a niche for themselves in their chosen field of study, allowing them to become well-rounded and discriminating citizens who are completely qualified for their chosen vocations in the workplace.



#### About the Civil Engineering Department

The Department of Civil Engineering started its journey from the College's inception nearly two decades back. Ever since, the Department has been successfully creating new knowledge, acquiring new capabilities, and at the same time, producing an intelligent human resource pool contributing to various domains of society. The development of expertise in the Department is commendable. Keeping the Department's vision in mind, the holistic growth of the students is focused upon, which instills a habit of continued learning with a sense of responsibility to contribute to the betterment of society. Besides, the students are encouraged to participate in internships, workshops, and seminars essential for developing practical knowledge. The Department has always been on a high growth path, primarily relying on experienced and dedicated faculty members working zealously and enthusiastically with a strong commitment to engineering education. Consequently, the Department provides Civil Engineering aspirants with a vibrant and optimum learning environment.



**CHAIRPERSON**  
PROF. TARAK KUMAR BANDYOPADHYAY

**COORDINATOR**  
MS. ARPITA DAS

**CO-COORDINATORS**  
DR. TANUMOY GHOSH  
DR. RAJDIP PAUL

**3-DAY WORKSHOP ON  
"ADVANCED SURVEYING USING DGPS  
AND TOTAL STATION"**

**28-30TH MARCH 2023**

**ORGANIZED BY  
CIVIL ENGINEERING DEPARTMENT OF HETC**

+033 2680 4121/2681 0505

[www.hetc.ac.in](http://www.hetc.ac.in) [mail@hetc.ac.in](mailto:mail@hetc.ac.in)

Hooghly Engineering & Technology College  
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West Bengal 712103

*R Paul*

**Dr. Rajdip Paul**  
HOD, Dept. of CE  
HETC, Hooghly.

*S.H.L. L.Y*

**Principal in Charge**  
Hooghly Engineering & Technology College  
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## Objective

The objective of the 3-day workshop is to offer comprehensive technical know-how on practical applications of Total Station (TS) and Digital Global Positioning System (DGPS) as advanced surveying techniques. In detail, the workshop will take up system concepts, design, operation, implementation, and applications of both TS and DGPS. Besides, detailed information on the GPS signal, its processing by the receiver, and the techniques by which GPS obtains position, velocity, and time are also under the scope. The specific objectives of the workshop are as follows:

- To gain an understanding of the measurement of angles, vertical and horizontal.
- To know the correct surveying terminology when using a total station
- To use the Total Station in a practical situation.
- To record the absolute location of any object.
- To comprehensively introduce GPS and DGPS technology, system concepts, design, operation, implementation, and applications, including critical information on DGPS concepts.
  - To provide detailed information on the GPS signal, its processing by the receiver and the techniques by which GPS obtains position, velocity, and time.
  - To present current information on the status, plans, schedule, and capabilities of GPS and other satellite-based systems with position velocity and time determination applications.
  - To fill in technical information gaps for those in the GPS and GNSS fields.

“ADVANCED SURVEYING WORKSHOP  
USING  
DGPS AND TOTAL STATION”

## WORKSHOP SCHEDULE

FOR 28<sup>th</sup>, 29<sup>th</sup> & 30<sup>th</sup> March

DATE	SESSION	EVENT	TIME
28 March	1st	INAUGURATION	09:00 AM TO 10:00 AM
		TEA BREAK	10:30 AM TO 10:45 AM
		INDUSTRY LECTURE BY MR. SUBBARAJU DAS	04:45 AM TO 05:00 PM
	2nd	BREAK	01:00 PM TO 02:00 PM
		NUMERICAL WORKSHOP: HOW TO USE THE TOTAL STATION TO MEASURE DISTANCE	02:30 PM TO 03:00 PM
		TEA BREAK	03:30 PM TO 03:45 PM
29 March	1st	SETTING UP THE TOTAL STATION IN THE FIELD	09:30 AM TO 10:00 AM
		TEA BREAK	10:30 AM TO 10:45 AM
		FIELD PREPARATION USING TOTAL STATION	11:45 AM TO 01:00 PM
	2nd	BREAK	01:00 PM TO 02:00 PM
		DIGITAL POSITIONING SYSTEMS	02:30 PM TO 03:00 PM
		TEA BREAK	03:30 PM TO 03:45 PM
30 March	1st	THE KINEMATIC GPS	09:30 AM TO 10:00 AM
		TEA BREAK	10:30 AM TO 10:45 AM
		DGPS PROCESSING OF TOTAL STATION	11:45 AM TO 01:00 PM
	2nd	BREAK	01:00 PM TO 02:00 PM
		TEA BREAK	02:30 PM TO 03:00 PM
		CLOSING SESSION	03:30 PM TO 04:00 PM



## REGISTRATION DETAILS

- The workshop is open to the faculty of Academic Institutions, PG, UC, and diploma students and Professionals from Industry
- The Registration fee for faculty of Academic Institutions and Industry Professionals is Rs. 300/- and for PG, UC, and diploma students is Rs. 100/-.
- Participants need to register themselves by filling out the google form link
- Pay the registration fee in the following bank account:

Account No - 50339432106  
Hooghly Engineering & Technology College  
Bank - INDIAN BANK  
Branch - Chinsurah  
IFSC code: IDIB000C593

The last date for receipt of the registration form is 25<sup>th</sup> March 2023. Selected participants will get an email acknowledgment on 26<sup>th</sup> March 2023.

## Address for Communication

- Ms. Arpita Das (Co-ordinator)**  
Email: arpita.das@hetc.ac.in  
Mobile: +919831356955
- Dr. Tanumoy Ghosh (Co-coordinator)**  
Email: tanumoyghosh@hetc.ac.in  
Mobile: +918961115386
- Dr. Rajdip Paul (Co-Coordinator)**  
Email: rajdip.paul@hetc.ac.in  
Mobile: +919831366180

For Registration



Scan QR Code

*R Paul*  
**Dr. Rajdip Paul**  
HOD, Dept. of CE  
HETC, Hooghly.

*S.P.L.*  
**Principal in Charge**  
Hooghly Engineering & Technology College  
Vivekananda Road, Pipulpati, Hooghly.





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## Hooghly Engineering and Technology College Note sheet

Date: 24.02.2023

The Civil Engineering Department is looking forward to organizing a 3-Day **WORKSHOP** on "**Advanced Surveying Using DGPS and Total Station**" from 28<sup>th</sup> to 30<sup>th</sup> March 2023. The tentative expenses for the workshop are furnished below for the information of the competent authority for necessary approval.

Sl. No.	Item	Rate	Expense/Item (Rs.)
1	Remuneration for the Resource Persons	Rs. 5000/day (for 3 Days)	15000
2	Traveling and accommodation of the Resource Persons	Lump sum	7000
3	Food for the Resource Persons	Lump sum	6000
4	Memento	Rs. 200/piece (for 5 persons)	1000
5	Tea and biscuit	Rs.20/Day × 3 Days (for 115 persons)	7000 (approx.)
6	Traveling allowance for invitations	Rs. 200/college × 10 colleges	2000
7	Printing (Gate, Flex, Certificates, Invitation card, Poster, ID card)	Lump sum	8000
8	Welcome kit for participants	Rs 30 per person (for 100 participants)	3000
9	Miscellaneous	Lump sum	6000
Total Budget			Rs. 55,000

The total expense of the program may change according to any change in the number of participants.

Arpita Das 24/2/23  
Ms. Arpita Das  
Coordinator

Dr. Tanumoy Ghosh  
Co-Coordinator

Dr. Rajdip Paul  
Co-Coordinator

Principal-in-charge,  
HETC  
Secretary,  
HETC  
President,  
HETC  
Secretary,  
HETC

Noted & forwarded for necessary approval. 24.02.23

Forwarded to President for n. approval  
Approved as proposed

Forwarded for n.a. 24/4/23

Dr. Rajdip Paul  
HOD, Dept. of CE  
HETC, Hooghly.

Principal in Charge  
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## **OBJECTIVES OF THE WORKSHOP**

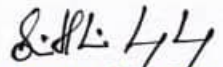
This 3-day course offers a comprehensive introduction to Total Station and DGPS technology, system concepts, design, operation, implementation, and applications, including detailed information on the GPS signal, its processing by the receiver and the techniques by which GPS obtains position, velocity, and time. The objective of the 3-day workshop is as follows:

- To gain an understanding of the measurement of angles, vertical and horizontal.
- To know the correct surveying terminology when using a total station
- To use the Total Station in a practical situation.
- To record the absolute location of any object.
- To comprehensively introduce GPS and DGPS technology, system concepts, design, operation, implementation, and applications, including critical information on DGPS concepts.
- To provide detailed information on the GPS signal, its processing by the receiver and the techniques by which GPS obtains position, velocity, and time.
- To present current information on the status, plans, schedule, and capabilities of GPS and other satellite-based systems with position velocity and time determination applications.
- To fill in technical information gaps for those in the GPS and GNSS fields.

## **WHO CAN ATTEND THE WORKSHOP?**

The faculty of Academic Institutions, UG, PG, diploma students, and Professionals from the Industry can attend the workshop.

  
**Dr. Rajdip Paul**  
HOD, Dept. of CE  
HETC, Hooghly.

  
**Principal in Charge**  
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## Topic Covered in 3-Day State Level Workshop on Advanced Surveying Using DGPS and Total Station, 28-30<sup>th</sup> March 2023.

### Day 1 Session 1

#### Topics covered:

- Introduction to Surveying and Levelling
- Concept of Traditional Surveying
- Limitation of traditional surveying
- Introduction of Advance Surveying
- Advantages and application of Total Station
- Principal of GPS, DGPS, Terrestrial laser scanner
- Application of GPS and DGPS.
- Review of Photogrammetric Surveying
- Concept of Digital Image Processing
- Applications of Geomatics and 3D Mapping in Civil Engineering

### Day 1 Session 2


#### Topics covered:

- Instrument Specification about Total Station and DGPS
- Setting the total Station in the field (Field Practice Centering, Levelling on Total Station)

### Day 2 Session 1

#### Topics covered:

- Field Practice on instrument setup, job selection, and Job store data.
- Field Practice on Topography Survey using Total Station
- Layout preparation using Total Station

  
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## Topic Covered in 3-Day State Level Workshop on Advanced Surveying Using DGPS and Total Station, 28-30<sup>th</sup> March 2023.

### Day 2 Session 2

#### Topics covered:

- Static Global Positioning System Surveying ( Understanding of Base Station and rover of GPS)
- Field Practice on Real-Time Kinematic and Differential GPS

### Day 3 Session 1


#### Topics covered:

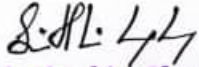
- Field practice on Stakeout points with GPS
- Field Practice on Topography Survey using Differential GPS

### Day 3 Session 2

#### Topics covered:

- **Data Processing of Total Station using software**
- **DGPS data Processing and locating the plot into a Google map**

  
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## Brief Profile of the Resource Person

### 1. Prof. Subhabrata Ghosh

#### Academic Qualification

- B.E Civil from Bengal Engineering College(DU) and M.E specializing in Structure from BESUS.

#### Professional Experience


- Worked as Field Engineer in Anirban Enterprise.
- At present, HOD, Dept. of GIS & GPS, and Lecturer in Survey Engineering at WestBengal Survey Institute.

#### Acted as

- HOD Civil Engineering
- Training & Placement Officer, West Bengal Survey Institute
- Internal Co-Ordinator, CDTP
- Convener, Syllabus Committee, GIS & GPS, WBSCT&VESD

#### Other Information:

- Act as a Resource Person in a Training programme on “Qualitative Improvement of Red Brick” organized by Nazrul Centenary Polytechnic and Directorate of MSME, Sub DIC Durgapur.
- Act as a Resource Person in a Faculty Development Programme organized by Narula Institute of Technology, Agarpara.
- Conducted Orientation programme on Advanced Survey for Polytechnic Faculties Conducted Industrial Training on Transmission Line Survey for EMC Limited.

  
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## Brief Profile of the Resource Person

### 2. Mr. Prabhat Kumar Mandal

#### Acted as

- Assistant Manager of Skipper Technologies India Private Limited.
- Organize multiple training on behalf of Skipper Technologies India Private Limited.

### 3. Mr. Amit Kumar

#### Acted as

- Senior Engineer of Skipper Technologies India Private Limited.
- Organize multiple training on behalf of Skipper Technologies India Private Limited.

### 4. Mr. Utpal Mondal


#### Acted as

- Application Engineer of Skipper Technologies India Private Limited.
- Organize multiple training on behalf of Skipper Technologies India Private Limited.

### 5. Mr. Mrinal Mondal

#### Acted as

- Application Engineer of Skipper Technologies India Private Limited.
- Organize multiple training on behalf of Skipper Technologies India Private Limited.

  
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## Participation List of 3-Day State Level Workshop on Advanced Surveying Using DGPS and Total Station, 28-30<sup>th</sup> March 2023.

Participant List For 3-Day Workshop on "Advanced Surveying and Workshop using DGPS and Total Station"					
Sl No	Name	Mobile No	Institution/ Organisation Name	Designation	Signature
1	SANKET AICH	8697595949	HETC	B Tech Student	Sanket Aich
2	Aikaprava Gangopadhyay	7998100964	HETC	B Tech Student	Aikaprava Gangopadhyay
3	Soham Chakraborty	8918977759	HETC	B Tech Student	Soham Chakraborty
4	Debanik Ghosh	8777862052	JU	M.Tech Student	Debanik Ghosh
5	Samata das	9330197919	HETC	B Tech Student	Samata Das
6	Lona Das	9330685853	HETC	B Tech Student	Lona Das
7	Subham Dutta	9883348683	HETC	B Tech Student	Subham Dutta
8	MONALISHA HOSSAIN	7449342692	HETC	B Tech Student	Monalisha Hossain
9	ABHIRUP DAM	7980123284	HETC	B.Tech Student	Abhirup Dam
10	ARJIT ROY	9093997584	HETC	B.Tech. Student	Arjit Roy
11	ABHRADIP MUKHERJEE	9830179057	HETC	B.Tech. Student	Abhradip Mukherjee
12	Srishti Ghosh	7278001009	HETC	B.Tech Student	Srishti Ghosh
13	SOMNATH DEY	6290212938	HETC	B.Tech. Student	Somnath Dey
14	Sohita Chatterjee	9883181468	HETC	B.Tech. Student	Sohita Chatterjee
15	Raj Sadhukhan	9874276032	HETC	B.Tech. Student	Raj Sadhukhan
16	Soham Chatterjee	8016767274	HETC	B.Tech. Student	Soham Chatterjee
17	Sourav Jana	7586807026	HETC	B.Tech. Student	Sourav Jana
18	Biswajit Koley	9083129963	HETC	B.Tech Student	Biswajit Koley
19	Ayan Mukhopadhyay	8240702572	HETC	B.Tech. Student	Ayan Mukhopadhyay
20	Subhadip Santra	7001864037	HETC	B.Tech. Student	Subhadip Santra
21	Pramis Jar	8918961216	HETC	B.Tech Student	Pramis Jar
22	Rahul Kumar	9798742935	HETC	B.Tech Student	Rahul Kumar
23	Soumalya Kumar	9749296112	HETC	B.Tech Student	Soumalya Kumar
24	Pronay Dhak	8910029976	HETC	B.Tech Student	Pronay Dhak
25	Sarnab Malik	8207018439	HETC	B.Tech Student	Sarnab Malik
26	Subinit Nandi	8777253745	HETC	B.Tech Student	Subinit Nandi
27	Arpan Pramanick	6295574059	HETC	B.Tech Student	Arpan Pramanick
28	Anubhav Mukherjee	8240716076	HETC	B.Tech Student	Anubhav Mukherjee
29	Suvom Ghosh	9123009690	HETC	B.Tech Student	Suvom Ghosh
30	BIPRAJIT DAS	7687868932	NITTTR	M.Tech. Student	Biprajit Das
31	SUTAPA DAS	7718135508	HETC	B.Tech Student	Sutapa Das
32	Puja Jana	9339099244	HETC	B.Tech Student	Puja Jana
33	Puja Ghosh	7679389845	HETC	B.Tech Student	Puja Ghosh
34	Asmita Datta	6290314279	HETC	B.Tech. Student	Asmita Datta
35	RAJ MUKHERJEE	6289518683	HETC	B.Tech. Student	Raj Mukherjee
36	Snigdha Ghoshal	7605858861	HETC	B.Tech Student	Snigdha Ghoshal
37	Keya Pal	9144085551	HETC	B.Tech Student	Keya Pal
38	Anirban Das	9038177797	HETC	B.Tech Student	Anirban Das
39	Anirban Bala	7980242594	HETC	B.Tech Student	Anirban Bala
40	Ashish Debnath	7001882663	HETC	B.Tech Student	Ashish Debnath
41	TONIMA DAS	9051770953	HETC	Faculty	TONIMA DAS
42	Koushik Debnath	9609027895	HETC	B.Tech Student	Koushik Debnath
43	BHASKAR DAS	8240173252	MIET	B.Tech Student	Bhaskar Das
44	Sarit Kundu	9064100345	HETC	B.Tech Student	Sarit Kundu
45	Nitish kumar mahto	7717705884	HETC	B.Tech Student	Nitish km Mahto
46	X Jagriti Nandi	9330952122	HETC	B.Tech Student	Jagriti Nandi

Dr. Rajdip Paul  
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Participant List For 3-Day Workshop on "Advanced Surveying and Workshop using DGPS and Total Station"					
Sl No	Name	Mobile No	Institution/ Organisation Name	Designation	Signature
47	Subhamaya Sen	8961512224	HETC	B Tech Student	Subhamaya Sen
48	Jagriti Nandi	9330952122	HETC	B Tech Student	Jagriti Nandi
49	Biswajit Majumder	7365853166	HETC	B Tech Student	Biswajit Majumder
50	Sibom Mondal	8910250395	HETC	B Tech Student	Sibom Mondal
51	Somnath Dey	9804958885	HETC	Faculty	Somnath Dey
52	Arhana Chakraborty	8777231278	HETC	B Tech Student	Arhana Chakraborty
53	Brajesh Anand	9771630366	HETC	B Tech Student	Brajesh Anand
54	Ranveer kumar	9006281905	HETC	B Tech Student	Ranveer Kumar
55	Sagar roy	8276806678	HETC	B Tech Student	Sagar Roy
56	Krishnendu Das	7044686713	HETC	B Tech Student	Krishnendu Das
57	Soumyadip Maji	8918316715	HETC	B Tech Student	Soumyadip Maji
58	Sumon Banerjee	9832873035	HETC	B Tech Student	Sumon Banerjee
59	Shibasish Deb	9836057817	HETC	Faculty	Shibasish Deb
60	Raju Khamaru	9732966912	HETC	B Tech Student	Raju Khamaru
61	Saheli Banshi	8240366721	HETC	B Tech Student	Saheli Banshi
62	Tushar Ghosh	8918743416	HETC	B Tech Student	Tushar Ghosh
63	PRIYA SHAW	8100117441	HETC	B Tech Student	Priya Shaw
64	Sagnik Naskar	7044104020	HETC	B Tech Student	Sagnik Naskar
65	Gitam Karmakar	9875613325	HETC	B Tech Student	Gitam Karmakar
66	Rahul Sadhukhan	8240950478	HETC	B Tech Student	Rahul Sadhukhan
67	Samrat Roy Chowdhury	7980243652	HETC	B Tech Student	Samrat Roy Chowdhury
68	Jayanta Bandyopadhyay	9433555936	HETC	Faculty	Jayanta Bandyopadhyay
69	Subhankar Pal	9748509112	HETC	B Tech Student	Subhankar Pal
70	Sourav Santra	9875429913	HETC	B Tech Student	Sourav Santra
71	Gaurav Mishra	7003279935	HETC	B Tech Student	Gaurav Mishra
72	Jaysree Banik	9883271821	HETC	B Tech Student	Jaysree Banik
73	Ayan Das	8240158793	HETC	B Tech Student	Ayan Das
74	SRIJITA PATRA	6295474856	HETC	B Tech Student	Srijata Patra
75	APURBA MAZUMDER	9064185496	HETC	B Tech Student	Apurba Mazumder
76	Arpita Chattopadhyay	9831396937	HETC	Faculty	Arpita Chattopadhyay
77	Subho Kumar pal	9382199507	HETC	B Tech Student	Subho Kumar Pal
78	PIYALI DAS	9830715351	HETC	Faculty	Piyali Das
79	Aditya paswan	7003760742	HETC	B Tech Student	Aditya Paswan
80	sayantan das	9330088761	HETC	B Tech Student	Sayantan Das
81	Bikash Yadav	8820183558	HETC	B Tech Student	Bikash Yadav
82	Subhra Biswas	7980916850	HETC	B Tech Student	Subhra Biswas
83	subarna chatterjee	8910383041	HETC	B Tech Student	Subarna Chatterjee
84	Priyo ghosh	6290307660	HETC	B Tech Student	Priyo Ghosh
85	Animesh Bhukta	6296210166	HETC	B Tech Student	Animesh Bhukta
86	Alokjit Halder	8697761819	HETC	B Tech Student	Alokjit Halder
87	Abhishek Pal	8981177486	HETC	B Tech Student	Abhishek Pal
88	Arunabha Roychowdhury	9433549020	HETC	B Tech Student	Arunabha Roychowdhury
89	Ritam Ghosh	8910589085	HETC	B Tech Student	Ritam Ghosh
90	Rajat Subhra Chowdhury	8100660233	HETC	B Tech Student	Rajat Subhra Chowdhury
91	Soumik Ghosh	9641311846	HETC	B Tech Student	Soumik Ghosh
92	Atanu Dey	6289402861	HETC	B Tech Student	Atanu Dey

Dr. Rajdip Paul  
HOD, Dept. of CE  
HETC, Hooghly.

*Dr. Rajdip Paul*  
Dr. Rajdip Paul  
HOD, Dept. of CE  
HETC, Hooghly.

*Siddhanta*  
Principal in Charge  
Hooghly Engineering & Technology College  
Vivekananda Road, Pipulpati, Hooghly.





# Hooghly Engineering and Technology College


Approved by AICTE, Recognize by UGC, Affiliated to MAKAUT (Formerly WBUT)

Vivekananda Road, Pipulpati, P.O. & Dist. Hooghly, Pin 712103 West Bengal

## Participation List of 3-Day State Level Workshop on Advanced Surveying Using DGPS and Total Station, 28-30<sup>th</sup> March 2023.

**Participant List For 3-Day Workshop on  
"Advanced Surveying and Workshop using DGPS and Total Station"**

Sl No	Name	Mobile No	Institution/ Organisation Name	Designation	Signature
93	Sudipta Karsabanik	9163162845	HETC	Faculty	Sudipta Karsabanik
94	JOYITA GOLDER	7001983271	JU	PhD Student	Joyita Golder
95	SUMAN MONDAL	7664977430	HETC	B.Tech. Student	Suman Mondal
96	Soumyadeep Sadhukhan	7029833425	HETC	B.Tech. Student	Soumyadeep Sadhukhan
97	Surojit Das	6290291435	MIET	B.Tech. Student	Surojit Das

  
**Dr. Rajdip Paul**  
HOD, Dept. of CE  
HETC, Hooghly.

  
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**Attendance Sheet of 3-Day Workshop on  
"Advanced Surveying and Workshop using DGPS and Total Station"**

Sl No	Name	Mobile No	Day 1 (28-03-2023)	Day 2 (29-03-2023)	Day 3 (30-03-2023)
1	Sanket Ach	8697595949	Sanket Ach	Sanket Ach	Sanket Ach
2	Arkaprava Gangopadhyay	7998100964	Arkaprava Gangopadhyay	Arkaprava Gangopadhyay	Arkaprava Gangopadhyay
3	Soham Chakraborty	8918977759	Soham Chakraborty	Soham Chakraborty	Soham Chakraborty
4	Debanik Ghosh	8777862052	Debanik Ghosh	Debanik Ghosh	Debanik Ghosh
5	Samata das	9330197919	Samata Das	Samata Das	Samata Das
6	Lona Das	9330685853	Lona Das	Lona Das	Lona Das
7	Subham Dutta	9883348683	Subham Dutta	Subham Dutta	Subham Dutta
8	Monalisha Hossain	7449342692	Monalisha Hossain	Monalisha Hossain	Monalisha Hossain
9	Abhirup Dam	7980123284	Abhirup Dam	Abhirup Dam	Abhirup Dam
10	Arijit Roy	9093997584	Arijit Roy	Arijit Roy	Arijit Roy
11	Abhirup Mukherjee	9830179057	Abhirup Mukherjee	Abhirup Mukherjee	Abhirup Mukherjee
12	Srishti Ghosh	7278001009	Srishti Ghosh	Srishti Ghosh	Srishti Ghosh
13	SOMNATH DEY	6290212938	Somnath Dey	Somnath Dey	Somnath Dey
14	Sohita Chatterjee	9883181468	Sohita Chatterjee	Sohita Chatterjee	Sohita Chatterjee
15	Raj Sadhukhan	9874276032	Raj Sadhukhan	Raj Sadhukhan	Raj Sadhukhan
16	Soham Chatterjee	8016767274	Soham Chatterjee	Soham Chatterjee	Soham Chatterjee
17	Sourav Jana	7586807026	Sourav Jana	Sourav Jana	Sourav Jana
18	Biswajit Koley	9083129963	Biswajit Koley	Biswajit Koley	Biswajit Koley
19	Ayan Mukhopadhyay	8240702572	Ayan Mukherjee	Ayan Mukherjee	Ayan Mukherjee
20	Subhadip Santra	7001864037	Subhadip Santra	Subhadip Santra	Subhadip Santra
21	Pramis Jar	8918961216	Pramis Jar	Pramis Jar	Pramis Jar
22	Rahul Kumar	9798742935	Rahul Kumar	Rahul Kumar	Rahul Kumar
23	Soumalya Kumar	9749296112	Soumalya Kumar	Soumalya Kumar	Soumalya Kumar
24	Pronay Dhak	8910029976	Pronay Dhak	Pronay Dhak	Pronay Dhak
25	Sarnab Malik	8207018439	Sarnab Malik	Sarnab Malik	Sarnab Malik
26	Subinit Nandi	8777253745	Subinit Nandi	Subinit Nandi	Subinit Nandi
27	Arpan Pramanick	6295574059	Arpan Pramanick	Arpan Pramanick	Arpan Pramanick
28	Anubhav Mukherjee	8240716076	Anubhav Mukherjee	Anubhav Mukherjee	Anubhav Mukherjee
29	Suvom Ghosh	9123009690	Suvom Ghosh	Suvom Ghosh	Suvom Ghosh
30	Biprajit Das	7687868932	Biprajit Das	Biprajit Das	Biprajit Das
31	Sutapa Das	7718135508	Sutapa Das	Sutapa Das	Sutapa Das
32	Puja Jana	9339099244	Puja Jana	Puja Jana	Puja Jana
33	Puja Ghosh	7679389845	Puja Ghosh	Puja Ghosh	Puja Ghosh
34	Asmita Datta	6290314279	Asmita Datta	Asmita Datta	Asmita Datta
35	Raj Mukherjee	6289518683	Raj Mukherjee	Raj Mukherjee	Raj Mukherjee
36	Snigdha Ghoshal	7605858861	Snigdha Ghoshal	Snigdha Ghoshal	Snigdha Ghoshal
37	Keya Pal	9144085551	Keya Pal	Keya Pal	Keya Pal
38	Anirban Das	9038177797	Anirban Das	Anirban Das	Anirban Das
39	Anirban Bala	7980242594	Anirban Bala	Anirban Bala	Anirban Bala
40	Ashish Debnath	7001882663	Ashish Debnath	Ashish Debnath	Ashish Debnath
41	Tonima Das	9051770953	Tonima Das	Tonima Das	Tonima Das
42	Koushik Debnath	9609027895	Koushik Debnath	Koushik Debnath	Koushik Debnath
43	Bhaskar Das	8240173252	Bhaskar Das	Bhaskar Das	Bhaskar Das
44	Sarit Kundu	9064100345	Sarit Kundu	Sarit Kundu	Sarit Kundu
45	Nitish kumar mahto	7717705884	Nitish kumar mahto	Nitish kumar mahto	Nitish kumar mahto
46	Jagriti Nandi	9330952122	Jagriti Nandi	Jagriti Nandi	Jagriti Nandi

Dr. Rajdip Paul  
HOD, Dept. of CE  
HETC, Hooghly.

*S.L.Ly*  
**Principal in Charge**  
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Vivekananda Road, Pipulpati, Hooghly.



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## Attendance Sheet of 3-Day Workshop on "Advanced Surveying and Workshop using DGPS and Total Station"

Sl No	Name	Mobile No	Day 1 (28-03-2023)	Day 2 (29-03-2023)	Day 3 (30-03-2023)
47	Subhamaya Sen	8961512224	Subhamaya Sen	Subhamaya Sen	Subhamaya Sen
48	Jagriti Nandi	9330952122	Jagriti Nandi	Jagriti Nandi	Jagriti Nandi
49	Biswajit Majumder	7365853166	Biswajit Majumder	Biswajit Majumder	Biswajit Majumder
50	Sibom Mondal	8910250395	Sibom Mondal	Sibom Mondal	Sibom Mondal
51	Somnath Dey	9804958885	Somnath Dey	Somnath Dey	Somnath Dey
52	Arhana Chakraborty	8777231278	Arhana Chakraborty	Arhana Chakraborty	Arhana Chakraborty
53	Brajesh Anand	9771630366	Brajesh Anand	Brajesh Anand	Brajesh Anand
54	Ranveer kumar	9006281905	Ranveer kumar	Ranveer kumar	Ranveer kumar
55	Sagar roy	8276806678	Sagar Roy	Sagar Roy	Sagar Roy
56	Krishnendu Das	7044686713	Krishnendu Das	Krishnendu Das	Krishnendu Das
57	Soumyadip Maji	8918316715	Soumyadip Maji	Soumyadip Maji	Soumyadip Maji
58	Sumon Banerjee	9832873035	Sumon Banerjee	Sumon Banerjee	Sumon Banerjee
59	Shibasish Deb	9836057817	Shibasish Deb	Shibasish Deb	Shibasish Deb
60	Raju Khamaru	9732966912	Raju Khamaru	Raju Khamaru	Raju Khamaru
61	Saheli Banshi	8240366721	Saheli Banshi	Saheli Banshi	Saheli Banshi
62	Tushar Ghosh	8918743416	Tushar Ghosh	Tushar Ghosh	Tushar Ghosh
63	Priya Shaw	8100117441	Priya Shaw	Priya Shaw	Priya Shaw
64	Sagnik Naskar	7044104020	Sagnik Naskar	Sagnik Naskar	Sagnik Naskar
65	Gitam Karmakar	9875613325	Gitam Karmakar	Gitam Karmakar	Gitam Karmakar
66	Rahul Sadhukhan	8240950478	Rahul Sadhukhan	Rahul Sadhukhan	Rahul Sadhukhan
67	Samrat Roy Chowdhury	7980243652	Samrat Roy Chowdhury	Samrat Roy Chowdhury	Samrat Roy Chowdhury
68	Jayanta Bandyopadhyay	9433555936	Jayanta Bandyopadhyay	Jayanta Bandyopadhyay	Jayanta Bandyopadhyay
69	Subhankar Pal	9748509112	Subhankar Pal	Subhankar Pal	Subhankar Pal
70	Sourav Santra	9875429913	Sourav Santra	Sourav Santra	Sourav Santra
71	Gaurav Mishra	7003279935	Gaurav Mishra	Gaurav Mishra	Gaurav Mishra
72	Jaysree Banik	9883271821	Jaysree Banik	Jaysree Banik	Jaysree Banik
73	Ayan Das	8240158793	Ayan Das	Ayan Das	Ayan Das
74	Srijita Patra	6295474856	Srijita Patra	Srijita Patra	Srijita Patra
75	Apurba Mazumder	9064185496	Apurba Mazumder	Apurba Mazumder	Apurba Mazumder
76	Arpita Chattopadhyay	9831396937	Arpita Chattopadhyay	Arpita Chattopadhyay	Arpita Chattopadhyay
77	Subho Kumar pal	9382199507	Subho Kumar pal	Subho Kumar pal	Subho Kumar pal
78	Piyali Das	9830715351	Piyali Das	Piyali Das	Piyali Das
79	Aditya paswan	7003760742	Aditya paswan	Aditya paswan	Aditya paswan
80	sayantan das	9330088761	sayantan das	sayantan das	sayantan das
81	Bikash Yadav	8820183558	Bikash Yadav	Bikash Yadav	Bikash Yadav
82	Subhra Biswas	7980916850	Subhra Biswas	Subhra Biswas	Subhra Biswas
83	subarna chatterjee	8910383041	subarna chatterjee	subarna chatterjee	subarna chatterjee
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91	Soumik Ghosh	9641311846	Soumik Ghosh	Soumik Ghosh	Soumik Ghosh
92	Atanu Dey	6289402861	Atanu Dey	Atanu Dey	Atanu Dey

*Signature*  
HOD, Dept of CE  
ETC, Hooghly

*Signature*  
**Principal in Charge**  
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94	Joyita Golder	7001983271	Joyita Golder	Joyita Golder	Joyita Golder
95	Suman Mondal	7864977430	Suman Mondal	Suman Mondal	Suman Mondal
96	Soumyadeep Sadhukhan	7029833425	Soumyadeep sadhukhan	Soumyadeep sadhukhan	Soumyadeep sadhukhan
97	Surojit Das	6290291435	Surojit Das	Surojit Das	Surojit Das

*[Signature]*  
Dr. Rajdip Paul  
HOD, Dept. of CE  
HETC, Hooghly

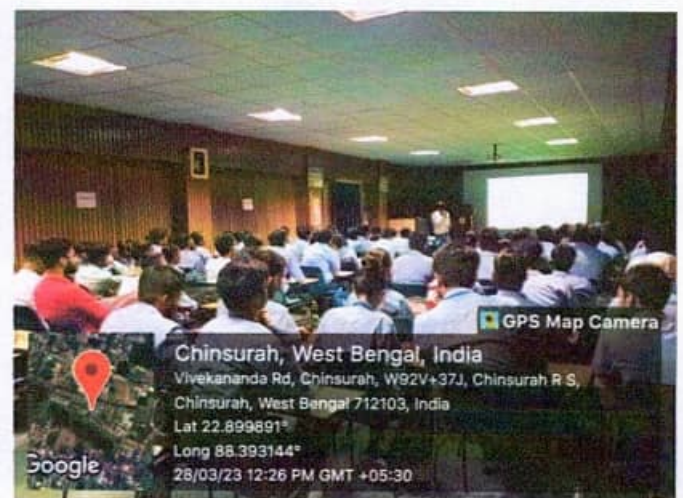
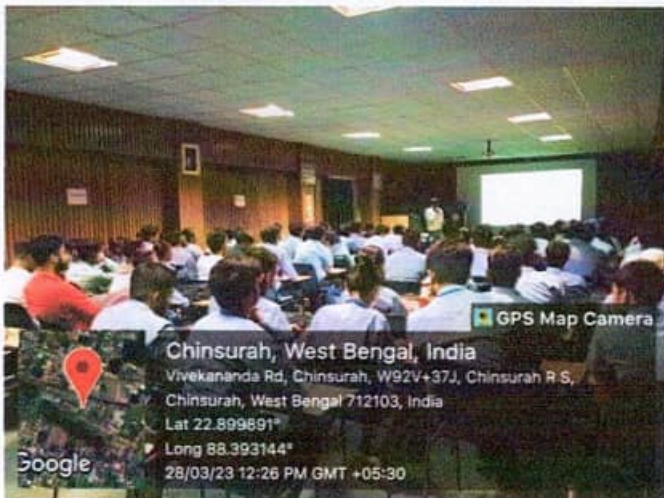
*[Signature]*

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*Dr. Rajdip Paul*  
**Dr. Rajdip Paul**  
HOD, Dept. of CE  
HETC, Hooghly.

*S. P. L. L. H.*  
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*R Paul*

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*S.P.L. 44*

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## Souvenir for resource person



**Dr. Rajdip Paul**  
HOD, Dept. of CE  
HETC, Hooghly.

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## Expenses of 3-Day State Level Workshop on Advanced Surveying Using DGPS and Total Station, 28-30<sup>th</sup> March 2023.

### Hooghly Engineering and Technology College Note sheet

Date: 05.04.2023

The Civil Engineering Department organized a 3-Day WORKSHOP on "Advanced Surveying Using DGPS and Total Station" from 28<sup>th</sup> to 30<sup>th</sup> March 2023. The actual expenses for the workshop are furnished below for the information of the competent authority.

Sl. No.	Item	Description	Expense
1	Flower Bouquets for Dignitaries of Dias	Seven Tube	420
2	Remuneration for the Resource Persons	For 5 resource person	14000
3	Accommodation of the Resource Persons	2 Days accommodation	3000
4	Food for Resource Persons	For 3 Days and 5 resource person	2546
5	Tea, Bunseurt, Lassi, Glucose-D	Tea break for 3 days in two half	3321
6	Memento	Five Mementos for 5 Resource Person	1100
7	Printing Cost	Flex, Certificate, Appreciation Letter, Poster, Brochure	4395
8	Welcome Kit For Participants	Folder, Pen, and Pad (100 Piece Each)	2820
9	Miscellaneous	Miscellaneous	350
<b>Total Expense</b>			<b>31952/-</b>

Principal placed for Principal's approval - 9000 (from Studies) by 22/3/23

Principal HETC: Arpita Das 5/4/23  
Dr. Tanumoy Ghosh 5/4/23  
Dr. Rajdip Paul 05/04/23

Forwarded to Secretary (HETCS) for approval and n.a.p.  
Secretary (HETCS): Forwarded to President for approval etc. by 5/4/23

Approved as proposed for n.a. by 5/4/23

*R Paul*  
**Dr. Rajdip Paul**  
HOD, Dept. of CE  
HETC, Hooghly.

*S.L.L.*  
**Principal in Charge**  
Hooghly Engineering & Technology College  
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<b>Total Expense</b>			<b>31952/-</b>

Principal HETC Placed for Principal's approval - 9000 (from Student) by 22/3/23

Arpita Das  
Ms. Arpita Das  
Coordinator  
5/4/23

Dr. Tanumoy Ghosh  
Co-Coordinator  
5/4/23

Dr. Rajdip Paul  
Co-Coordinator  
05/04/23

Forwarded to Secretary (HETCS) for approval and a.g.p.  
Forwarded to Principal for approval 05/04/23

Secretary HETCS

Principal HETC

Secretary HETCS

Approved as proposed

Forwarded for a.g.p. 5/4/23

Dr. Rajdip Paul  
05/4/23

Dr. Rajdip Paul  
HOD, Dept. of CE  
HETC, Hooghly.

**Post conference report on the national conference on advancement in technology and artificial intelligence.**

On Saturday , 1st April , 2023 a national conference was organised by the computer science engineering department as well as the electronics and communication engineering department of the Hooghly engineering and technology college . This conference was organised to enlighten the students with the latest facts regarding the emerging technologies and advancement in artificial intelligence and robotics .

This event was organised basically for the students pursuing their b. Tech in Cse and Ece department of the host college as well as other colleges were also welcomed for this technical webinar as the entire conference was held in both online and offline mood as it was on a national level . This was made possible through the help of the most feasible online video conferencing platform none other than google meet. More than 200 participants were a part of this conference . The major participation was from Hooghly engineering and technology college itself.

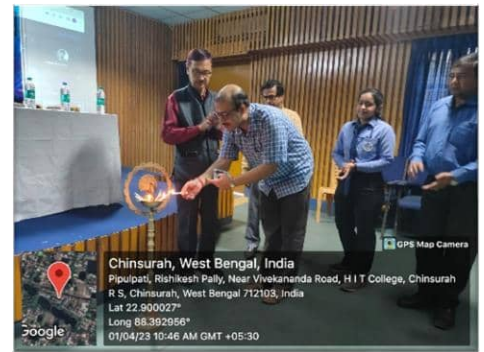
The webinar began at about 10:30 am in the seminar hall . The event was graced by the august presence of prof.(DR).Tarak Kumar Bandyopadhyay , president Hetcs, prof (DR). Abhijit Maity, secretary , Hetcs , prof. (DR). Subhasis Bose principal , Hetc and one of the guest speaker DR. Tanmay Pal, asst . prof. From School of Mechatronics and robotics iiest, Shibpur, West Bengal as well as the other faculty members especially the hod of Cse dept. DR. Biswajit Haldar. The conference started with the felicitation of the honourable guests and lighting of the holy lamp .

The beginning of the conference was marked by the first session of the keynote speaker DR. Tanmoy pal , from School of Mechatronics , Shibpur , West Bengal. His lecture was an amazing one as all of the attendees came to know the interesting facts regarding the inventions of biotechnical gadgets that are made to ensure better living of the disabled such as prosthetic hands and legs as well as hearing aids , specialised glasses for the colour blinds , development of brail for blinds to communicate ,pacemaker of the heart and so many other inventions with their functioning and design were explained.

This session was followed by the online technical session by DR C.M. Jadhao , principal of Mauli group of institution's college of engineering and technology Shegaon. He enlightened the students with the brand-new features and developments in artificial intelligence and the advancement in technology and machines , like the new launch of chatbots and the brand new "GPT" – named chatGPT . Their working principles and its usage were also covered in his lecture.

The last and the final session was of DR. Ajay Thakre . Professor in Electronics engineering of Sipna college of engineering Amravati on the emerging networks and technologies , especially the 5g network . This was also an online session ; in this he had covered the pros and cons of the entire 5g network setup in India . The session gave a clear picture of the effectiveness of the 5g network , its working method, and it also stated the clear scenario of other networks and technologies. The "5g India 2020 mission" was one of the major areas of discussion and many such progress in tech world were discussed.

Thus , after a long stretch of six hours the seminar ended at 4:30pm . The entire conference was a splendid success as lots of information was shared. This was one of the most interesting tech conferences till date and one of the most necessary one as teaching-learning processes are undergoing radical changes as technology advances in education, which is favouring the emergence of new styles of learning which should always remain a part of our education system as every generation should update themselves with the along with the updating world.



## Report on Webinar/Seminar/Conference/Workshop conducted

**Title:** One-day Webinar on  
“**Microwave and Millimetre-Wave Applications and Challenges**”

**Speaker:** Dr. Arani Ali Khan, Assistant Professor, Electrical Engineering  
Department, IIT Jodhpur

**Date:** 28<sup>th</sup> May, 2020

**Time:** 10 AM to 11 AM

### Preamble:

A One-day Webinar on “Microwave and Millimetre-Wave Applications and Challenges” has been conducted on 28<sup>th</sup> may, 2020, at Hooghly Engineering & Technology College (HETC), Hooghly through the online platform ‘Cisco Webex’ in order to spread the applications and challenges of both Microwave and Millimetre-wave. This webinar has been organized by Electronics & Communication Engineering Department, HETC.

### Participant’s Profile:

A total of 70 candidates from HETC participated in this event. Among the participants 63 were Students, 6 were Faculty members and 1 was Technical Assistant. 53 participants from ECE Dept., 15 from EE Dept. and 2 from others had successfully completed this session. Among the students, 4 students from 1<sup>st</sup> year, 36 students from 2<sup>nd</sup> year, 20 students from 3<sup>rd</sup> year and 5 students from 4<sup>th</sup> year were present at that particular event.

#### Designation

[More Details](#)

Faculty	6
Technical Assistant	1
Student	63
Others	0

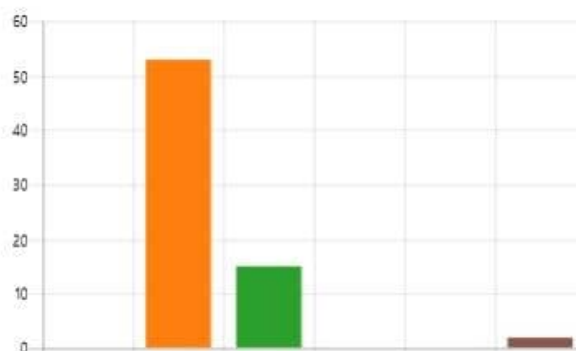


Pic 2.1

#### Department

[More Details](#)

CSE	0
ECE	53
EE	15
CE	0
ME	0
Others	2



Pic 2.2



**Pic 2.3**

**Description about the Program:**

On the inaugural session Mr. Subhajit Roy, Assistant Professor, Electronics & Communication Engineering Department, HETC had addressed to the all participants with short biography of the speaker.

After that Dr. Arani Ali Khan had delivered his presentation on that particular topic. He basically highlighted on the recent application and challenges on Microwave and Millimetre-wave. He also described the need of microwave and millimetre wave frequencies. Some circuits and graphical representations were demonstrated. He also illustrated the recent research areas and job perspectives on this field.

Mr. Subhajit Roy proposed vote of thanks.

The entire programme was co-ordinated with the support of the Principal, HOD EE, Coordinator ECE, Coordinator EE, Registrar, Dy. Registrar, faculty, technical assistant and students of the department of Electronics & Communication Engineering and Electrical Engineering, Hooghly Engineering & Technology College, Hooghly.

The entire program was hosted by Mr. Subhajit Roy, Assistant Professor, Electronics & Communication Engineering Department, Hooghly Engineering & Technology College.

**Feedback:**

All the participants had given their feedback through online form (Microsoft Form) at the end of the session. The average rating of their overall experience was 4.10.

Overall Experience

[More Details](#)

70

Responses



4.10 Average Rating

**Pic 4.1**

**Future Perspectives:**

The department of Electronics & Communication Engineering is looking forward to organizing future Webinars on different technical topics during this lock-down period caused by Covid-19.

### Certificates:

All the registered candidates had got their e-Certificates after successful participation. All the certificates were uploaded in OneDrive (Microsoft) and the link had been shared with the participants through email. An appreciation Certificate (e-Certificate) was also sent to the speaker through email after completion of the program.



Pic 6.1 Student's Certificate



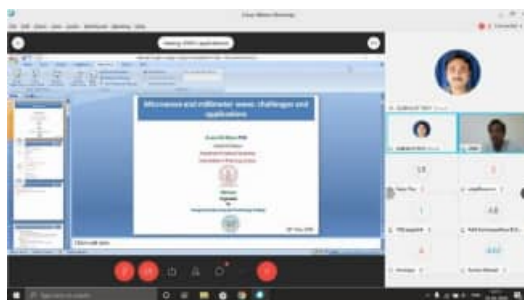
Pic 6.2 Speaker's Certificate

**Report Submitted by:** Mr. Subhajit Roy

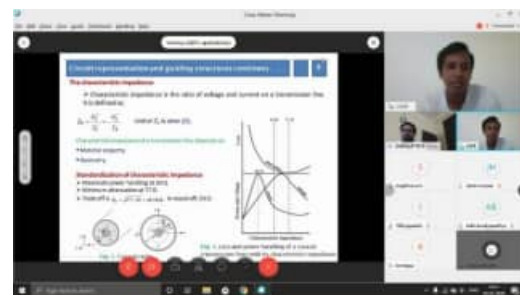
**Designation:** Assistant Professor

**Department:** Electronics & Communication Engineering, HETC

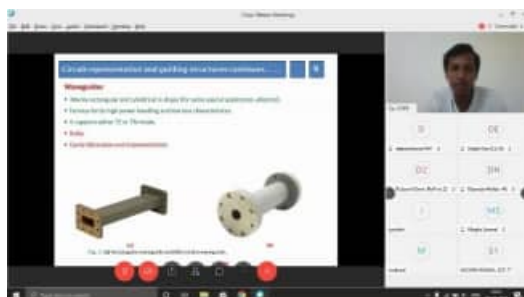
### Snapshots:



Pic 8.1



Pic 8.2



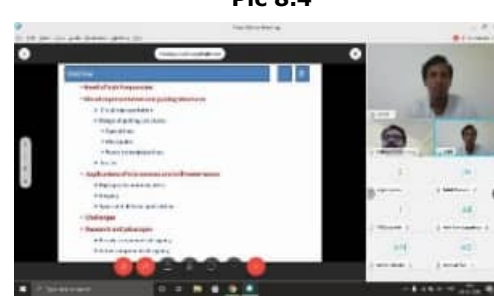
Pic 8.3



Pic 8.4



Pic 8.5



Pic8.6

# Hooghly Engineering & Technology College



## Moocs Certificate

This certificate is computer generated and can be verified by scanning the QR code given below. This will display the certificate from the NPTEL repository, <https://nptel.ac.in/noc/>



Roll No: NPTEL19CS39S51450286

To  
ANUSREE DEY  
VILL+POST=BHANDERHATI,DIST=HOOGHLY,P.S=DHANIAKHALI  
BHANDERHATI  
HOOGHLY  
WEST BENGAL  
712301  
PH. NO :8910342733



Score	Type of Certificate
>=90	Elite+Gold
75-89	Elite+Silver
>=60	Elite
40-59	Successfully Completed
<40	No Certificate

No. of credits recommended by NPTEL:3

An additional 1 credit may be awarded if the University deems it fit, based on the actual student effort involved.



Elite

# NPTEL Online Certification

(Funded by the Ministry of HRD, Govt. of India)



This certificate is awarded to

**ANUSREE DEY**

for successfully completing the course

## An Introduction to Programming Through C++

with a consolidated score of **71** %

Online Assignments	23/25	Programming Exam	25/25	Proctored Exam	22.79/50
--------------------	-------	------------------	-------	----------------	----------

Total number of candidates certified in this course: **516**

Jul-Oct 2019  
(12 week course)

**Prof. Sridhar Iyer**  
Head, CDEEP & NPTEL Coordinator  
IIT Bombay



Indian Institute of Technology Bombay



Roll No: NPTEL19CS39S51450286

To validate and check scores: <https://nptel.ac.in/noc>

This certificate is computer generated and can be verified by scanning the QR code given below. This will display the certificate from the NPTEL repository, <https://nptel.ac.in/noc/>

Roll No: NPTEL20CS35S1420286

To

SUBINIT NANDI  
B1413 , KALYANI , NADIA , WEST BENGAL  
TOWN  
NADIA  
WEST BENGAL - 741235  
PH. NO :8777253745



No. of credits recommended by NPTEL:3

An additional 1 credit may be awarded if the University deems it fit, based on the actual student effort involved.



# NPTEL Online Certification

(Funded by the Ministry of HRD, Govt. of India)



This certificate is awarded to

**SUBINIT NANDI**

for passing the course

**The Joy of Computing using Python**

with Score\* **57** %

Covid-19  
impacted  
January 2020  
semester

**Prof. Devendra Jalihal**  
Chairman  
Centre for Continuing Education, IITM

Jan-Apr 2020  
(12 week course)

**Prof. Andrew Thangaraj**  
NPTEL Coordinator  
IIT Madras



Indian Institute of Technology Madras



\*Continuous online assessment score

To validate and check scores: <https://nptel.ac.in/noc/>



# NATIONAL PROGRAMME ON TECHNOLOGY ENHANCED LEARNING

A JOINT VENTURE BY INDIAN INSTITUTES OF TECHNOLOGY & INDIAN INSTITUTE OF SCIENCE



Date: 16th June 2020

To Whomsoever it may concern

This is to confirm that ANIRBAN CHAKRABORTY (Email id: canirban091@gmail.com) had enrolled to the NPTEL course **Introduction to internet of things (12 Weeks)** on the SWAYAM platform (swayam.gov.in), during the Jan-Apr 2020 semester.



The scores obtained by the learner in the unproctored online assignments are as follows and maybe used as deemed appropriate. (Every assignment score shown below is out of 100 marks.)

Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
A1 : NA	A1 : NA	A1 : 87	A1 : 93	A1 : 80	A1 : 77	A1 : 69	A1 : 93	A1 : 87	A1 : NA	A1 : 100	A1 : NA

\*NA- Not Attempted



Prof. Andrew Thangaraj  
NPTEL Coordinator  
IIT Madras

# NATIONAL PROGRAMME ON TECHNOLOGY ENHANCED LEARNING

A JOINT VENTURE BY INDIAN INSTITUTES OF TECHNOLOGY & INDIAN INSTITUTE OF SCIENCE



**Date: 16th June 2020**

To Whomsoever it may concern

This is to confirm that KUNTAL NASKAR (Email id: kuntalnm10@gmail.com) had enrolled to the NPTEL course **Introduction to Civil Engineering Profession (8 Weeks)** on the SWAYAM platform (swayam.gov.in), during the Jan-Apr 2020 semester.



The scores obtained by the learner in the unproctored online assignments are as follows and maybe used as deemed appropriate. (Every assignment score shown below is out of 100 marks.)

Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8
A1 : 60	A1 : NA	A1 : NA	A1 : 90	A1 : 80	A1 : 90	A1 : 100	A1 : 90

\*NA- Not Attempted



Prof. Andrew Thangaraj  
NPTEL Coordinator  
IIT Madras

This certificate is computer generated and can be verified by scanning the QR code given below. This will display the certificate from the NPTEL repository, <https://nptel.ac.in/noc/>



Roll No: NPTEL19HS35S61450183

To  
POUSHALI MANNA  
191/A, C. S. MUKHERJEE STREET  
KONNAGAR  
HOOGHLY  
WEST BENGAL  
712235  
PH. NO :8617257156



Score	Type of Certificate
>=90	Elite+Gold
75-89	Elite+Silver
>=60	Elite
40-59	Successfully Completed
<40	No Certificate

No. of credits recommended by NPTEL:2

An additional 1 credit may be awarded if the University deems it fit, based on the actual student effort involved.



Elite

# NPTEL Online Certification

(Funded by the Ministry of HRD, Govt. of India)



This certificate is awarded to

**POUSHALI MANNA**

for successfully completing the course

**Ethics in Engineering Practice**

with a consolidated score of **73** %

Online Assignments	22.08/25	Proctored Exam	51/75
--------------------	----------	----------------	-------

Total number of candidates certified in this course: 2054

A. Goswami

**Prof. Adrijit Goswami**

Dean, Continuing Education & NPTEL Coordinator  
IIT Kharagpur

Aug-Oct 2019

(8 week course)



Indian Institute of Technology Kharagpur



Roll No: NPTEL19HS35S61450183

To validate and check scores: <https://nptel.ac.in/noc/>

This certificate is computer generated and can be verified by scanning the QR code given below. This will display the certificate from the NPTEL repository, <https://nptel.ac.in/noc/>



Roll No: NPTEL19HS31S11380001

To  
RAJDEEP GHOSH  
NEAR AMBAGAN SADHARAN PATHAGAR, BURNPUR,  
ASANSOL  
BARDHAMAN  
WEST BENGAL  
713325  
PH. NO :8101843224



Score	Type of Certificate
>=90	Elite+Gold
75-89	Elite+Silver
>=60	Elite
40-59	Successfully Completed
<40	No Certificate

No. of credits recommended by NPTEL:2

An additional 1 credit may be awarded if the University deems it fit, based on the actual student effort involved.



Elite

# NPTEL Online Certification

(Funded by the Ministry of HRD, Govt. of India)



This certificate is awarded to

**RAJDEEP GHOSH**

for successfully completing the course

## Technical English for Engineers

with a consolidated score of **80** %

Online Assignments	23.33/25	Proctored Exam	56.63/75
--------------------	----------	----------------	----------

*Devendra Jalihal*

**Prof. Devendra Jalihal**  
Chairman  
Centre for Continuing Education, IITM

Total number of candidates certified in this course: **2734**

Jul-Sep 2019  
(8 week course)

*Prof. Andrew Thangaraj*

**Prof. Andrew Thangaraj**  
NPTEL Coordinator  
IIT Madras



Indian Institute of Technology Madras





JOHNS HOPKINS  
UNIVERSITY

Sep 22, 2020

Dwaipayan Biswas

has successfully completed

A Crash Course in Data Science

an online non-credit course authorized by Johns Hopkins University and offered through  
Coursera

Jeffrey Leek, PhD, Brian Caffo, PhD, MS, Roger D. Peng, PhD

Some online courses may draw on material from courses taught on campus but are not equivalent to on-campus courses. This certificate does not affirm that this learner was enrolled as a student at Johns Hopkins University in any way. It does not confer a JHU grade, course credit or degree; establish any relationship between this learner and JHU or other JHU affiliate; enroll or register this learner at JHU or other JHU affiliate or in any course offered by JHU; or entitle this learner to access or use the resources of JHU or other JHU affiliates beyond the online courses provided by Coursera.

COURSE  
CERTIFICATE



Verify at [coursera.org/verify/9SUXVF3DZ47Z](https://coursera.org/verify/9SUXVF3DZ47Z)

Coursera has confirmed the identity of this individual and their participation in the course.

This certificate does not affirm that this learner was enrolled as a student at Johns Hopkins University. It does not confer a JHU grade, course credit or degree; establish a relationship between this learner and JHU; enroll or register this learner at JHU or in any course offered by JHU; or entitle this learner to access or use resources beyond the online courses provided by Coursera.



08/06/2020

**PARTHIB KUMAR SARKAR**

has successfully completed

**AI For Everyone**

an online non-credit course authorized by deeplearning.ai and offered through  
Coursera

A handwritten signature in blue ink that reads "Andrew Ng".

Adjunct Professor Andrew Ng  
Computer Science Department  
Stanford University

**COURSE  
CERTIFICATE**



Verify at [coursera.org/verify/LH9VD5YGDJ5P](https://coursera.org/verify/LH9VD5YGDJ5P)

Coursera has confirmed the identity of this individual and  
their participation in the course.

# NATIONAL PROGRAMME ON TECHNOLOGY ENHANCED LEARNING

A JOINT VENTURE BY INDIAN INSTITUTES OF TECHNOLOGY & INDIAN INSTITUTE OF SCIENCE



Date: 16th June 2020

To Whomsoever it may concern

This is to confirm that SRIMANTA BAG (Email id: srimantabag1996pm@gmail.com) had enrolled to the NPTEL course **Water Supply Engineering (12 Weeks)** on the SWAYAM platform (swayam.gov.in), during the Jan-Apr 2020 semester.



The scores obtained by the learner in the unproctored online assignments are as follows and maybe used as deemed appropriate. (Every assignment score shown below is out of 100 marks.)

Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
A1 : 13	A1 : NA	A1 : 70	A1 : 50	A1 : 45	A1 : 65	A1 : NA	A1 : NA	A1 : 47	A1 : 100	A1 : 80	A1 : 47

\*NA- Not Attempted



Prof. Andrew Thangaraj  
NPTEL Coordinator  
IIT Madras

# NATIONAL PROGRAMME ON TECHNOLOGY ENHANCED LEARNING

A JOINT VENTURE BY INDIAN INSTITUTES OF TECHNOLOGY & INDIAN INSTITUTE OF SCIENCE



Date: 15th June 2020

To Whomsoever it may concern

This is to confirm that TIASA ROY (Email id: me.roytiasa@gmail.com) had enrolled to the NPTEL course **Principles of Communication Systems - I (12 Weeks)** on the SWAYAM platform (swayam.gov.in), during the Jan-Apr 2020 semester.



The scores obtained by the learner in the unproctored online assignments are as follows and maybe used as deemed appropriate. (Every assignment score shown below is out of 100 marks.)

Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
A1 : 20	A1 : 30	A1 : 10	A1 : 10	A1 : 60	A1 : 10	A1 : NA	A1 : NA	A1 : NA	A1 : NA	A1 : NA	A1 : NA

\*NA- Not Attempted



Prof. Andrew Thangaraj  
NPTEL Coordinator  
IIT Madras



# NATIONAL PROGRAMME ON TECHNOLOGY ENHANCED LEARNING

A JOINT VENTURE BY INDIAN INSTITUTES OF TECHNOLOGY & INDIAN INSTITUTE OF SCIENCE



Date: 16th June 2020

To Whomsoever it may concern

This is to confirm that TUSHITA DAS (Email id: tushitadas16@gmail.com) had enrolled to the NPTEL course **Basic Linear Algebra (8 Weeks)** on the SWAYAM platform (swayam.gov.in), during the Jan-Apr 2020 semester.



The scores obtained by the learner in the unproctored online assignments are as follows and maybe used as deemed appropriate. (Every assignment score shown below is out of 100 marks.)

Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8
A1 : 60	A1 : 100	A1 : 40	A1 : NA	A1 : NA	A1 : NA	A1 : NA	A1 : NA
A2 : 100	A2 : 100	A2 : NA	A2 : Nil	A2 : NA	A2 : Nil	A2 : Nil	A2 : Nil

\*NA- Not Attempted | Nil- No assignment



Prof. Andrew Thangaraj  
NPTEL Coordinator  
IIT Madras

# NATIONAL PROGRAMME ON TECHNOLOGY ENHANCED LEARNING

A JOINT VENTURE BY INDIAN INSTITUTES OF TECHNOLOGY & INDIAN INSTITUTE OF SCIENCE



Date: 15th June 2020

To Whomsoever it may concern

This is to confirm that INDRASISH DAS (Email id: indra.srp007@gmail.com) had enrolled to the NPTEL course **Advanced Probability Theory (12 Weeks)** on the SWAYAM platform (swayam.gov.in), during the Jan-Apr 2020 semester.



The scores obtained by the learner in the unproctored online assignments are as follows and maybe used as deemed appropriate. (Every assignment score shown below is out of 100 marks.)

Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
A1 : 70	A1 : 27	A1 : 71	A1 : 10	A1 : 45	A1 : 57	A1 : 35	A1 : 50	A1 : 37	A1 : NA	A1 : 35	A1 : 50

\*NA- Not Attempted



Prof. Andrew Thangaraj  
NPTEL Coordinator  
IIT Madras

This certificate is computer generated and can be verified by scanning the QR code given below. This will display the certificate from the NPTEL repository, <https://nptel.ac.in/noc/>

Roll No: NPTEL20CE02S11730017

To  
BISWAJIT KUNDU  
ASMANJA DEY STREET; BARABAZAR  
SANTIPUR; DISTRICT-NADIA; WEST BENGAL  
SANTIPUR  
WEST BENGAL - 741404  
PH. NO :6296910075



Score	Type of Certificate
>=90	Elite+Gold
75-89	Elite+Silver
>=60	Elite
40-59	Successfully Completed
<40	No Certificate

No. of credits recommended by NPTEL:2

An additional 1 credit may be awarded if the University deems it fit, based on the actual student effort involved.



Elite

# NPTEL Online Certification

(Funded by the Ministry of HRD, Govt. of India)



This certificate is awarded to  
**BISWAJIT KUNDU**  
for successfully completing the course

## Introduction to Civil Engineering Profession

with a consolidated score of **73** %

Online Assignments	23.33/25	Proctored Exam	49.5/75
--------------------	----------	----------------	---------

*Devendra Jalihal*

**Prof. Devendra Jalihal**  
Chairman  
Centre for Continuing Education, IITM

Total number of candidates certified in this course: **117**

Jan-Mar 2020  
(8 week course)

*Prof. Andrew Thangaraj*

**Prof. Andrew Thangaraj**  
NPTEL Coordinator  
IIT Madras



Indian Institute of Technology Madras



This certificate is computer generated and can be verified by scanning the QR code given below. This will display the certificate from the NPTEL repository, <https://nptel.ac.in/noc/>

Roll No: NPTEL20MG35S21010022

To  
SUPARNA DAS  
DHARAMPUR, TANTIPARA.  
P.O-CHINSURAH, DIST-HOOGHLY  
CHINSURAH  
WEST BENGAL - 712101  
PH. NO :9674589387



Score	Type of Certificate
>=90	Elite+Gold
75-89	Elite+Silver
>=60	Elite
40-59	Successfully Completed
<40	No Certificate

No. of credits recommended by NPTEL:3

An additional 1 credit may be awarded if the University deems it fit, based on the actual student effort involved.



# NPTEL Online Certification

(Funded by the Ministry of HRD, Govt. of India)



This certificate is awarded to

**SUPARNA DAS**

for successfully completing the course

## Entrepreneurship

with a consolidated score of **56** %

Online Assignments	20.84/25	Proctored Exam	35.25/75
--------------------	----------	----------------	----------

*Devendra Jalihal*

**Prof. Devendra Jalihal**  
Chairman  
Centre for Continuing Education, IITM

Total number of candidates certified in this course: **232**

**Jan-Apr 2020**  
(12 week course)

*Prof. Andrew Thangaraj*

**Prof. Andrew Thangaraj**  
NPTEL Coordinator  
IIT Madras



Indian Institute of Technology Madras



This certificate is computer generated and can be verified by scanning the QR code given below. This will display the certificate from the NPTEL repository, <https://nptel.ac.in/noc/>



Roll No: NPTEL19CS47S51450351

To  
SRIMANTA GHOSH  
BINAGRAM GHOSHPARA  
BINAGRAM  
HOOGHLY  
WEST BENGAL  
712401  
PH. NO :7908061389



Score	Type of Certificate
>=90	Elite+Gold
75-89	Elite+Silver
>=60	Elite
40-59	Successfully Completed
<40	No Certificate

No. of credits recommended by NPTEL:2

An additional 1 credit may be awarded if the University deems it fit, based on the actual student effort involved.



# NPTEL Online Certification

(Funded by the Ministry of HRD, Govt. of India)



This certificate is awarded to  
**SRIMANTA GHOSH**  
for successfully completing the course

## Design and Analysis of Algorithms

with a consolidated score of **52** %

Online Assignments	18/25	Proctored Exam	33.75/75
--------------------	-------	----------------	----------

*Devendra Jalihal*

**Prof. Devendra Jalihal**  
Chairman  
Centre for Continuing Education, IITM

Total number of candidates certified in this course: **465**

**Aug-Oct 2019**  
(8 week course)

*Andrew Thangaraj*

**Prof. Andrew Thangaraj**  
NPTEL Coordinator  
IIT Madras



Indian Institute of Technology Madras



This certificate is computer generated and can be verified by scanning the QR code given below. This will display the certificate from the NPTEL repository, <https://nptel.ac.in/noc/>

Roll No: NPTEL21CE04S11740018

To

SUBINIT NANDI  
B-14/13 , KALYANI , NADIA , WEST BENGAL  
PO:KALYANI , NIMTALA BUS STAND  
KALYANI  
WEST BENGAL - 741235  
PH. NO :8777253745



Score	Type of Certificate
>=90	Elite+Gold
75-89	Elite+Silver
>=60	Elite
40-59	Successfully Completed
<40	No Certificate

No. of credits recommended by NPTEL:2

An additional 1 credit may be awarded if the University deems it fit, based on the actual student effort involved.



Elite

# NPTEL Online Certification

(Funded by the Ministry of HRD, Govt. of India)



This certificate is awarded to

**SUBINIT NANDI**

for successfully completing the course

**Plastic Waste Management**

with a consolidated score of **61** %

Online Assignments	23.33/25	Proctored Exam	38/75
--------------------	----------	----------------	-------

Total number of candidates certified in this course: **1651**

Prof. G P Raja Sekhar  
Dean, Continuing Education  
IIT Kharagpur

Jan-Mar 2021  
(8 week course)

Prof. Debjani Chakraborty  
Coordinator, NPTEL  
IIT Kharagpur



Indian Institute of Technology Kharagpur



Roll No:NPTEL21CE04S11740018

To validate and check scores: <https://nptel.ac.in/noc/>



University of Colorado

Boulder | Colorado Springs | Denver | Anschutz Medical Campus

Jun 29, 2021

Suvom Ghosh

has successfully completed

Teamwork Skills: Communicating Effectively in  
Groups

an online non-credit course authorized by University of Colorado Boulder and offered  
through Coursera

*Matthew Koschmann*

Matthew A. Koschmann, PhD  
Associate Professor  
Department of Communication  
University of Colorado Boulder

COURSE  
CERTIFICATE



Verify at [coursera.org/verify/A7UCQH58X9N3](https://coursera.org/verify/A7UCQH58X9N3)

Coursera has confirmed the identity of this individual and their  
participation in the course.

# CaLARTS

Jun 28, 2021

ARUNWITA BERA

has successfully completed

The Language of Design: Form and Meaning

an online non-credit course authorized by California Institute of the Arts and offered through Coursera



Yasmin Khan Gibson, Instructor



Randy Nakamura, Instructor

COURSE  
CERTIFICATE



Verify at [coursera.org/verify/C3NQZ2HBQ5DP](https://coursera.org/verify/C3NQZ2HBQ5DP)

Coursera has confirmed the identity of this individual and their participation in the course.



# CaLARTS

Jun 30, 2021

Jaysree Banik

has successfully completed

The Language of Design: Form and Meaning

an online non-credit course authorized by California Institute of the Arts and offered through Coursera



Yasmin Khan Gibson, Instructor



Randy Nakamura, Instructor

COURSE  
CERTIFICATE



Verify at [coursera.org/verify/UPCRv289v7P9](https://coursera.org/verify/UPCRv289v7P9)

Coursera has confirmed the identity of this individual and their participation in the course.

# Yale

Jun 30, 2021

## Rupa Hazra

has successfully completed

### Essentials of Global Health

an online non-credit course authorized by Yale University and offered through Coursera

*RICHARD SKOLNIK*

Richard Skolnik

Former Lecturer, Department of Health Policy and Management, Yale School of Public Health and Lecturer in the Practice of Management, Yale School of Management, 2012-2016.

COURSE  
CERTIFICATE



Verify at [coursera.org/verify/3K8WM4CPFREU](https://coursera.org/verify/3K8WM4CPFREU)

Coursera has confirmed the identity of this individual and their participation in the course.



Jun 28, 2021

Rupa Hazra

has successfully completed

Introductory Human Physiology

an online non-credit course authorized by Duke University and offered through Coursera

COURSE  
CERTIFICATE



A handwritten signature in black ink, appearing to read "Jennifer Carbrey".

Jennifer Carbrey, Ph.D.  
Assistant Research Professor  
Cell Biology Department  
School of Medicine  
Duke University

A handwritten signature in black ink, appearing to read "Emma R. Jakoi".

Emma R. Jakoi, Ph.D.  
Associate Research Professor  
Cell Biology Department  
School of Medicine  
Duke University

Verify at [coursera.org/verify/BNP3JRTUCMUK](https://coursera.org/verify/BNP3JRTUCMUK)  
Coursera has confirmed the identity of this individual and their  
participation in the course.



THE UNIVERSITY  
of EDINBURGH



Jun 30, 2021

Gaurav Mishra

has successfully completed

Code Yourself! An Introduction to Programming

an online non-credit course authorized by The University of Edinburgh and Universidad  
ORT Uruguay and offered through Coursera

Dr Areti Manataki  
School of Informatics  
The University of Edinburgh

Dr Inés Kereki  
Engineering School  
Universidad ORT Uruguay

COURSE  
CERTIFICATE



Verify at [coursera.org/verify/6S45HA97SDEF](https://coursera.org/verify/6S45HA97SDEF)  
Coursera has confirmed the identity of this individual and their  
participation in the course.



AMERICAN MUSEUM  
OF NATURAL HISTORY



Jun 30, 2021

Sanchari Bhattacharya

has successfully completed

Ecology: Ecosystem Dynamics and Conservation

an online non-credit course authorized by American Museum of Natural History, Howard Hughes Medical Institute and offered through Coursera

Ana Luz Porzecanski  
Director, Center for Biodiversity and Conservation  
American Museum of Natural History

COURSE  
CERTIFICATE



Verify at [coursera.org/verify/4MUY2MEMNYYW](https://coursera.org/verify/4MUY2MEMNYYW)  
Coursera has confirmed the identity of this individual and their participation in the course.



Jun 30, 2021

# Arnab Dutta

has successfully completed

## Introduction to Personal Branding

an online non-credit course authorized by University of Virginia and offered through Coursera

A handwritten signature in black ink that reads "Kimberley R. Barker".

Kimberley R. Barker, MLIS  
Manager for Technology Education & Computing  
Claude Moore Health Sciences Library

### COURSE CERTIFICATE



Verify at [coursera.org/verify/ZMAQZ6P8RG6R](https://coursera.org/verify/ZMAQZ6P8RG6R)

Coursera has confirmed the identity of this individual and their participation in the course.



The State University  
of New York

Jun 30, 2021

Sagnik Dutta

has successfully completed

How to Write a Resume (Project-Centered Course)

an online non-credit course authorized by The State University of New York and offered through Coursera

A handwritten signature in black ink that reads "Holly Justice". The signature is written in a cursive style and is positioned above a horizontal dotted line.

Holly Justice  
Career Counselor  
University at Buffalo Career Services

COURSE  
CERTIFICATE



Verify at [coursera.org/verify/E7QYSB9XWJWM](https://coursera.org/verify/E7QYSB9XWJWM)  
Coursera has confirmed the identity of this individual and their  
participation in the course.



Jun 30, 2021

**Samarpita Hangsa**

has successfully completed

**Personal & Family Financial Planning**

an online non-credit course authorized by University of Florida and offered through  
Coursera

A handwritten signature in black ink that reads 'Michael D. Gutter'.

Michael Gutter Ph.D., Associate Professor, Interim FCS Program Leader, and Financial Management State Specialist for the Department of Family, Youth, and Community Sciences, in the Institute for Food and Agricultural at the University of Florida

**COURSE  
CERTIFICATE**



Verify at [coursera.org/verify/ZB6HSFFCPWEX](https://coursera.org/verify/ZB6HSFFCPWEX)  
Coursera has confirmed the identity of this individual and their participation in the course.





Jun 18, 2021

**Ayshik Bhattacharya**

has successfully completed

**Networking and Security Architecture with  
VMware NSX**

an online non-credit course authorized by VMware and offered through Coursera

*Chris McCain*

Pat Gelsinger  
Chief Executive Officer

Chris McCain  
Director of Product Management, Networking & Security

COURSE  
CERTIFICATE



Verify at [coursera.org/verify/CLU7ZZUZF8TN](https://coursera.org/verify/CLU7ZZUZF8TN)  
Coursera has confirmed the identity of this individual and their  
participation in the course.

This certificate is computer generated and can be verified by scanning the QR code given below. This will display the certificate from the NPTEL repository, <https://nptel.ac.in/noc/>

Roll No: NPTEL20CE48S41010032

To  
BIRENDRA SHAW  
BANKRA MISHRA PARA, BANKRA, HOWRAH  
BANKRA MISHRA PARA NEAR POLICE PHARI  
KOLKATA  
WEST BENGAL - 711403  
PH. NO :6290952193



Score	Type of Certificate
>=90	Elite+Gold
75-89	Elite+Silver
>=60	Elite
40-59	Successfully Completed
<40	No Certificate

No. of credits recommended by NPTEL:1

An additional 1 credit may be awarded if the University deems it fit, based on the actual student effort involved.



Elite

# NPTEL Online Certification

(Funded by the Ministry of HRD, Govt. of India)



This certificate is awarded to  
**BIRENDRA SHAW**  
for successfully completing the course


## Geotechnical Engineering Laboratory

with a consolidated score of **87** %

Online Assignments	24.17/25	Proctored Exam	63/75
--------------------	----------	----------------	-------

Total number of candidates certified in this course: **442**

Sep-Oct 2020  
(4 week course)

  
**Prof. Sridhar Iyer**  
Head, CDEEP & NPTEL Coordinator  
IIT Bombay



Indian Institute of Technology Bombay



This certificate is computer generated and can be verified by scanning the QR code given below. This will display the certificate from the NPTEL repository, <https://nptel.ac.in/noc/>

Roll No: NPTEL20CE44S41730019

To  
OINDRILA BHATTACHARYYA  
8, SADGOPE PARA ROAD,  
BHATPARA, PIN-743123, N 24 PGS  
8, SADGOPE PARA ROAD, BHATPARA, PIN-  
743123, N 24 PGS  
BHATPARA  
WEST BENGAL - 743123  
PH. NO :9433757255



Score	Type of Certificate
>=90	Elite+Gold
75-89	Elite+Silver
>=60	Elite
40-59	Successfully Completed
<40	No Certificate

No. of credits recommended by NPTEL:2

An additional 1 credit may be awarded if the University deems it fit, based on the actual student effort involved.



Elite

# NPTEL Online Certification

(Funded by the Ministry of HRD, Govt. of India)



This certificate is awarded to  
**OINDRILA BHATTACHARYYA**  
for successfully completing the course

## Project Planning & Control

with a consolidated score of **67** %

Online Assignments	23.58/25	Proctored Exam	43.5/75
--------------------	----------	----------------	---------

*Devendra Jalihal*

**Prof. Devendra Jalihal**  
Chairman  
Centre for Continuing Education, IITM

Total number of candidates certified in this course: **518**

Sep-Nov 2020  
(8 week course)

*Prof. Andrew Thangaraj*  
**Prof. Andrew Thangaraj**  
NPTEL Coordinator  
IIT Madras



Indian Institute of Technology Madras



This certificate is computer generated and can be verified by scanning the QR code given below. This will display the certificate from the NPTEL repository, <https://nptel.ac.in/noc/>

Roll No: NPTEL21CS14S13020119

To  
JAYANTA DHALI  
SHIBPUR 2ND LANE  
POST - TRIBENI PS - MOGRA DIST - HOOGHLY  
BANSBERIA  
WEST BENGAL - 712503  
PH. NO :9330540478



Score	Type of Certificate
>=90	Elite+Gold
75-89	Elite+Silver
>=60	Elite
40-59	Successfully Completed
<40	No Certificate

No. of credits recommended by NPTEL:2

An additional 1 credit may be awarded if the University deems it fit, based on the actual student effort involved.



Elite

# NPTEL Online Certification

(Funded by the Ministry of HRD, Govt. of India)



This certificate is awarded to

**JAYANTA DHALI**

for successfully completing the course

## Cloud Computing

with a consolidated score of **69** %

Online Assignments	24.38/25	Proctored Exam	44.27/75
--------------------	----------	----------------	----------

Total number of candidates certified in this course: **1535**

Prof. G P Raja Sekhar  
Dean, Continuing Education  
IIT Kharagpur

Feb-Apr 2021  
(8 week course)

Prof. Debjani Chakraborty  
Coordinator, NPTEL  
IIT Kharagpur



Indian Institute of Technology Kharagpur



# Yale

Aug 10, 2020

## Soumadeep Roy

has successfully completed

### Moralities of Everyday Life

an online non-credit course authorized by Yale University and offered through Coursera



Paul Bloom  
Brooks and Suzanne Ragen Professor of Psychology  
Yale University

COURSE  
CERTIFICATE



Verify at:  
<https://coursera.org/verify/2FSJ5NH6PARD>

Coursera has confirmed the identity of this individual and their participation in the course.



JOHNS HOPKINS  
UNIVERSITY

Jun 6, 2021

Soumadeep Roy

has successfully completed

HTML, CSS, and Javascript for Web Developers

an online non-credit course authorized by Johns Hopkins University and offered through  
Coursera

Yaakov Chaikin  
Adjunct Professor, Graduate Computer Science  
Whiting School of Engineering  
Johns Hopkins University

COURSE  
CERTIFICATE



Verify at:  
[coursera.org/verify/TJ2ZDT9YU76L](https://coursera.org/verify/TJ2ZDT9YU76L)

Coursera has confirmed the identity of this individual and their participation in the course.

This certificate does not affirm that this learner was enrolled as a student at Johns Hopkins University. It does not confer a JHU grade, course credit or degree; establish a relationship between this learner and JHU; enroll or register this learner at JHU or in any course offered by JHU; or entitle this learner to access or use resources beyond the online courses provided by Coursera.



JOHNS HOPKINS  
UNIVERSITY

Jul 22, 2020

Tushar Atha

has successfully completed

Statistical Inference

an online non-credit course authorized by Johns Hopkins University and offered through  
Coursera

Jeff Leek, PhD; Roger Peng, PhD; Brian Caffo, PhD  
Department of Biostatistics  
Johns Hopkins Bloomberg School of Public Health

COURSE  
CERTIFICATE



Verify at:

[coursera.org/verify/K2HTZELBDT2G](https://coursera.org/verify/K2HTZELBDT2G)

Coursera has confirmed the identity of this individual and their participation in the course.

This certificate does not affirm that this learner was enrolled as a student at Johns Hopkins University. It does not confer a JHU grade, course credit or degree; establish a relationship between this learner and JHU; enroll or register this learner at JHU or in any course offered by JHU; or entitle this learner to access or use resources beyond the online courses provided by Coursera.

This certificate is computer generated and can be verified by scanning the QR code given below. This will display the certificate from the NPTEL repository, <https://nptel.ac.in/noc/>

Roll No: NPTEL21CS17S23020075

To  
ARKA DATTA  
MORAH, HARIPAL, HOOGHLY  
WEST BENGAL - 712403  
PH. NO : 7477883770



Score	Type of Certificate
>=90	Elite+Gold
75-89	Elite+Silver
>=60	Elite
40-59	Successfully Completed
<40	No Certificate

No. of credits recommended by NPTEL:3

An additional 1 credit may be awarded if the University deems it fit, based on the actual student effort involved.



# NPTEL Online Certification

(Funded by the Ministry of HRD, Govt. of India)



This certificate is awarded to

**ARKA DATTA**

for successfully completing the course

## Introduction to Internet of Things

with a consolidated score of **54** %

Online Assignments	23.5/25	Proctored Exam	30/75
--------------------	---------	----------------	-------

Total number of candidates certified in this course: **2555**

Prof. G P Raja Sekhar  
Dean, Continuing Education  
IIT Kharagpur

Jan-Apr 2021  
(12 week course)

Prof. Debjani Chakraborty  
Coordinator, NPTEL  
IIT Kharagpur



Indian Institute of Technology Kharagpur







The State University  
of New York

Feb 4, 2021

**Arkadip Santra**

has successfully completed

**Solar Energy Basics**

an online non-credit course authorized by The State University of New York and offered  
through Coursera

*Neal Abrams*

Neal Abrams  
Associate Professor

COURSE  
CERTIFICATE



Verify at [coursera.org/verify/5XQ5C6TCUYXL](https://coursera.org/verify/5XQ5C6TCUYXL)  
Coursera has confirmed the identity of this individual and their  
participation in the course.

This certificate is computer generated and can be verified by scanning the QR code given below. This will display the certificate from the NPTEL repository, <https://nptel.ac.in/noc/>

Roll No: NPTEL21CS22S21010048

To  
SUBHAM PAL  
4(2/2) N. C. GHOSH SARANI  
SHEORAPHULI, HOOGHLY  
SHEORAPHULI  
WEST BENGAL - 712223  
PH. NO :7044767983



Score	Type of Certificate
>=90	Elite+Gold
75-89	Elite+Silver
>=60	Elite
40-59	Successfully Completed
<40	No Certificate

No. of credits recommended by NPTEL:2

An additional 1 credit may be awarded if the University deems it fit, based on the actual student effort involved.



Elite

# NPTEL Online Certification

(Funded by the Ministry of HRD, Govt. of India)



This certificate is awarded to

**SUBHAM PAL**

for successfully completing the course

## Design and Analysis of Algorithms

with a consolidated score of **61** %

Online Assignments	23.5/25	Proctored Exam	37.5/75
--------------------	---------	----------------	---------

Total number of candidates certified in this course: **279**

*Devendra Jalihal*

**Prof. Devendra Jalihal**  
Chairman  
Centre for Continuing Education, IITM

Jan-Mar 2021  
(8 week course)

*Prof. Andrew Thangaraj*

**Prof. Andrew Thangaraj**  
NPTEL, Coordinator  
IIT Madras



Indian Institute of Technology Madras





4 Courses

Python Programming  
Essentials

Python Data  
Representations

Python Data Analysis

Python Data Visualization



30-Sep-2020

**Soumabha Banerjee**

has successfully completed the online, non-credit Specialization

# Introduction to Scripting in Python

This specialization is intended for beginners who intend to master essential programming skills. Through four courses, you will cover key Python programming concepts which will prepare you to use Python to perform common scripting tasks. This will provide a solid foundation for future careers in data science, software engineering, or other careers involving programming.

Joe Warren  
Professor  
Dept. of Computer  
Science  
Rice University

Scott Rixner  
Professor  
Dept. of Computer  
Science  
Rice University

The online specialization named in this certificate may draw on material from courses taught on-campus, but the included courses are not equivalent to on-campus courses. Participation in this online specialization does not constitute enrollment at this university. This certificate does not confer a University grade, course credit or degree, and it does not verify the identity of the learner.

Verify this certificate at:  
[coursera.org/verify/specialization/6J447BY9RVS8](https://coursera.org/verify/specialization/6J447BY9RVS8)



5 Courses

Introduction to HTML5

Introduction to CSS3

Interactivity with JavaScript

Advanced Styling with Responsive Design

Web Design for Everybody Capstone



Sep 11, 2020

**ASISH SAMANTA**

has successfully completed the online, non-credit Specialization

# Web Design for Everybody: Basics of Web Development & Coding

This Specialization covers how to write syntactically correct HTML5 and CSS3, and how to create interactive web experiences with JavaScript. Mastering this range of technologies will allow you to develop high quality web sites that, work seamlessly on mobile, tablet, and large screen browsers accessible. During the capstone you will develop a professional-quality web portfolio demonstrating your growth as a web developer and your knowledge of accessible web design. This will include your ability to design and implement a responsive site that utilizes tools to create a site that is accessible to a wide audience, including those with visual, auidial, physical, and cognitive impairments.

*Colleen van Lent*

Colleen van Lent, Ph.D.  
Lecturer  
School of Information,  
University of Michigan

The online specialization named in this certificate may draw on material from courses taught on-campus, but the included courses are not equivalent to on-campus courses. Participation in this online specialization does not constitute enrollment at this university. This certificate does not confer a University grade, course credit or degree, and it does not verify the identity of the learner.

Verify this certificate at:  
[coursera.org/verify/specialization/E3P4PLBZV2JE](https://coursera.org/verify/specialization/E3P4PLBZV2JE)

**W** UNIVERSITY *of* WASHINGTON

08/31/2020

**Rajdeep Ghosh**

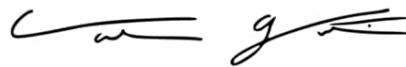
has successfully completed

**Machine Learning Foundations: A Case Study Approach**

a MOOC from the University of Washington and offered through Coursera



Emily Fox  
Amazon Professor of Machine Learning  
Statistics



Carlos Guestrin  
Amazon Professor of Machine Learning  
Computer Science and Engineering

**COURSE  
CERTIFICATE**



Verify at [coursera.org/verify/DHVMP6VRG8HZ](https://coursera.org/verify/DHVMP6VRG8HZ)  
Coursera has confirmed the identity of this individual and  
their participation in the course.

# **W** UNIVERSITY *of* WASHINGTON

Nov 1, 2020

## Rajdeep Ghosh

has successfully completed

### Machine Learning: Regression

a MOOC from the University of Washington and offered through Coursera

COURSE  
CERTIFICATE



Handwritten signatures of Emily Fox and Carlos Guestrin in black ink.

Emily Fox  
Amazon Professor of Machine Learning  
Statistics

Carlos Guestrin  
Amazon Professor of Machine Learning  
Computer Science and Engineering

Verify at [coursera.org/verify/2LU8YNP6T2K8](https://coursera.org/verify/2LU8YNP6T2K8)  
Coursera has confirmed the identity of this individual and their  
participation in the course.

Jul 19, 2020

Arghya Chakraborty

has successfully completed

Introduction to Programming with MATLAB

an online non-credit course authorized by Vanderbilt University and offered through  
Coursera



Handwritten signature of Akos Ledeczki in black ink.

Akos Ledeczki, Ph.D.  
Professor  
Computer Engineering, Computer Science, and  
Electrical Engineering

Handwritten signature of J. Michael Fitzpatrick in black ink.

J. Michael Fitzpatrick, PhD  
Professor Emeritus  
Computer Science, Computer Engineering, Electrical Engineering, Neurosurgery, and Radiology

Verify at [coursera.org/verify/NUB6SJ3JNPF](https://coursera.org/verify/NUB6SJ3JNPF)  
Coursera has confirmed the identity of this individual and their  
participation in the course.



Certificate no: UC-a2e72950-287f-4e6b-8424-bd8cc566d334

Certificate url: [ude.my/UC-a2e72950-287f-4e6b-8424-bd8cc566d334](https://ude.my/UC-a2e72950-287f-4e6b-8424-bd8cc566d334)

Reference Number: 0004

CERTIFICATE OF COMPLETION

# Complete Digital Marketing Course for Local Businesses 2021

Instructors **Ing. Tomas Moravek | SEO, Facebook Ads & Facebook Marketing Expert, SEO, Facebook Ads & Digital Marketing Academy, Hazel Owens, Beck Robertson, Frantisek Stehlik**

## Avi Shee

Date **July 26, 2021**

Length **67.5 total hours**



# MICHIGAN STATE UNIVERSITY

10 Jul, 2021

## Reshmi Shaw

has successfully completed

### Write Your First Novel

an online non-credit course authorized by Michigan State University and offered through  
Coursera



David Wheeler  
Director, Media Sandbox  
Department of Media and Information

## COURSE CERTIFICATE



Verify at [coursera.org/verify/3NAZN5P9L49F](https://coursera.org/verify/3NAZN5P9L49F)  
Coursera has confirmed the identity of this individual and their  
participation in the course.

This certificate is computer generated and can be verified by scanning the QR code given below.

Roll No: NPTEL22CE40S33650132

To  
SOUVIK SARKAR  
3NO DURGANAGAR, CHAKDAHA, NADIA  
3NO DURGANAGAR, CHAKDAHA, NADIA  
CHAKDAHA  
WEST BENGAL - 741222  
PH. NO : 7477577628



Score	Type of Certificate
>=90	Elite+Gold
75-89	Elite+Silver
>=60	Elite
40-59	Successfully Completed
<40	No Certificate

No. of credits recommended by NPTEL:3

An additional 1 credit may be awarded if the University deems it fit, based on the actual student effort involved.



# NPTEL Online Certification

(Funded by the MoE, Govt. of India)



This certificate is awarded to

**SOUVIK SARKAR**

for successfully completing the course

## Basic Construction Materials

with a consolidated score of **51** %

Online Assignments	21.44/25	Proctored Exam	30/75
--------------------	----------	----------------	-------

Total number of candidates certified in this course: **975**

*Devendra Jalihal*

**Prof. Devendra Jalihal**  
Chairman  
Centre for Continuing Education, IITM

Jan-Apr 2022  
(12 week course)

*Andrew Thangaraj*

**Prof. Andrew Thangaraj**  
NPTEL, Coordinator  
IIT Madras



Indian Institute of Technology Madras



# Verified Certificate



A handwritten signature in black ink, appearing to read 'Maureen Lonergan'.

**Maureen Lonergan**  
Director, Training and Certification  
Amazon Web Services (AWS)

This is to certify that

**Rahul Dom**

successfully completed and received a passing grade in

**AWS-AWS-OTP-AWSD16: AWS Cloud Technical  
Essentials**

a course of study offered by AWS, an online learning  
initiative of AWS.



**Verified Certificate**  
Issued April 30, 2022

**Valid Certificate ID**  
[161896ecfa2e40f9a04c235a5badc7ae](#)

# Verified Certificate



*Coreen Ryskamp*

Coreen Ryskamp  
Program Manager, IBM Security Learning Services

IBM

This is to certify that

**Rahul Dom**

successfully completed and received a passing grade in

## **Cybfun.1.0: Cybersecurity Basics**

a course of study offered by IBM, an online learning initiative of IBM.



**Verified Certificate**  
Issued April 30, 2022

**Valid Certificate ID**  
[0f8805962ccd4157bd0ec9cb9a319a49](#)

**Certificado**  
**Verificado**



Esto es para certificar que

**Rahul Dom**

completó y aprobó

**LED-TD3x: Liderazgo en la Era Digital**

un curso de estudio ofrecido por TecdeMonterreyX, una iniciativa de aprendizaje en línea de Tecnológico de Monterrey mediante edX.

**Juan Antonio Enciso González**  
Director del programa OneMBA y el MBA - GBS  
*Tecnológico de Monterrey*

**Arcadio Luis Guevara Espejel**  
Profesor de Cátedra en EGADE  
*Tecnológico de Monterrey*



**Certificado Verificado**  
Emitido el abril 30, 2022

**ID Válida del Certificado**  
[5a3c0fbf5608465cb3eb7543aa64074e](#)

**Esfuerzo**  
32 horas

**Certificado**  
**Verificado**



Ing. Miguel Pérez Gómez  
Rector

*Universidad Anáhuac Mayab*

Esto es para certificar que

**Rahul Dom**

completó y aprobó

**UAM.CP3.1x: Inglés básico: conversacional y networking**

un curso de estudio ofrecido por AnahuacX, una iniciativa de aprendizaje en línea de Universidades Anáhuac mediante edX.



**Certificado Verificado**  
Emitido el mayo 7, 2022

**ID Válida del Certificado**  
[98d8446e2b084c7a85fdfe71a97b6a85](#)

**Esfuerzo**  
32 horas

# Verified Certificate

HarvardX

This is to certify that

**RUPAN BISWAS**

successfully completed and received a passing grade in

**PH526x: Using Python for Research**

a course of study offered by HarvardX, an online learning initiative of Harvard University.



Jukka-Pekka "JP" Onnela  
Associate Professor of Biostatistics  
*Harvard University*



**Verified Certificate**  
Issued July 13, 2021

**Valid Certificate ID**  
[6e0fe28f58c643cb8a63f7a4a7560144](#)

**Verified  
Certificate**



Technische Universität München

This is to certify that

**Upasana Mukherjee**

successfully completed and received a passing grade in

**QPLS1x: Six Sigma: Define and Measure**

a course of study offered by TUMx, an online learning initiative  
of Technical University of Munich.

**Martin Grunow**

Professor of Production and Supply Chain Management

*Technische Universität München*

**Holly Ott**

Senior Lecturer Technische Universität München

Professor of Engineering and Business

*Hochschule der Bayerischen Wirtschaft*



**Verified Certificate**

Issued October 18, 2021

**Valid Certificate ID**

[b4c104bf2edb45f3b6ae6bedaf0cba1e](https://courses.edx.org/certificates/b4c104bf2edb45f3b6ae6bedaf0cba1e)



# Verified Certificate

**W** UNIVERSITY of WASHINGTON

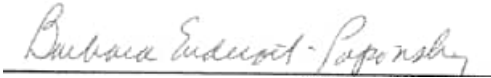
This is to certify that

**Soumodip Taki**

successfully completed and received a passing grade in

**CYB003x: Building Your Cybersecurity Toolkit**

a course of study offered by UWashingtonX, an online learning initiative of University of Washington.



Dr. Barbara Endicott-Popovsky

Executive Director, Center for Information Assurance and  
Cybersecurity

Professor, University of Washington

*University of Washington Center of Academic Excellence*



Verified Certificate  
Issued April 19, 2022

Valid Certificate ID  
ad38f2e50d7744c0a37416f658486aa33

# Verified Certificate



Rav Ahuja

AI and Data Science Program Director

IBM

This is to certify that

Soumodip Taki

successfully completed and received a passing grade in

## AI0101EN: AI for Everyone: Master the Basics

a course of study offered by IBM, an online learning initiative of IBM.



Verified Certificate

Issued April 18, 2022

Valid Certificate ID

ad38f2e50d7744c0a3416f658486aa33

1/18/2022

# Verified Certificate




This is to certify that

**Ishan Mondal**

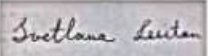
successfully completed and received a passing grade in

**DS0105EN: Data Science Tools**

a course of study offered by IBM, an online learning initiative of IBM.

  
Romeo Kienzler  
Chief Data Scientist  
IBM

  
Maureen McElaney  
Developer Advocate  
IBM

  
Svetlana Levitan  
Senior Developer Advocate with IBM Center for Open Data and AI Technologies  
IBM



Verified Certificate  
Issued April 18, 2022

Valid Certificate ID  
[d5feafad0aa24bfab9c88aeb15d25](https://courses.edx.org/certificates/d5feafad0aa24bfab9c88aeb15d25)



Certificate no: UC-e07aaf5e-e3a0-4091-8182-d03b7f0c62fb

Certificate url: [ude.my/UC-e07aaf5e-e3a0-4091-8182-d03b7f0c62fb](https://ude.my/UC-e07aaf5e-e3a0-4091-8182-d03b7f0c62fb)

Reference Number: 0004

CERTIFICATE OF COMPLETION

# The Complete Android N Developer Course

Instructors **Rob Percival, Marc Stock, Codestars by Rob Percival**

## Tuhin Mukherjee

Date **April 29, 2022**

Length **32.5 total hours**

# Verified Certificate



**Upkar Lidder**  
Senior Software Engineer  
*IBM*

This is to certify that

**AYAN ROY**

successfully completed and received a passing grade in

**CAD220EN: Developing Cloud Applications with  
Node.js and React**

a course of study offered by IBM, an online learning  
initiative of IBM.



**Verified Certificate**  
Issued April 28, 2022

**Valid Certificate ID**  
[d733ef0b41a24a1e926c879aade2c8ba](https://courses.edx.org/certificates/d733ef0b41a24a1e926c879aade2c8ba)

# Verified Certificate



A handwritten signature in black ink, appearing to read 'Alex Akison'.

Alex Akison  
Ph.D., Data Scientist

IBM

This is to certify that

**Ahana Paul**

successfully completed and received a passing grade in

**DS0101EN: Introduction to Data Science**

a course of study offered by IBM, an online learning initiative of IBM.



Verified Certificate  
Issued April 19, 2022

Valid Certificate ID  
[ad38f2e50d7744c0a37416f658486aa33](#)



# Verified Certificate

HarvardX

This is to certify that

**Mouli Ghosh**

successfully completed and received a passing grade in

**HUM12x: Masterpieces of World Literature**

a course of study offered by HarvardX, an online learning initiative of  
Harvard University.

**Martin Puchner**

Byron and Anita Wien Professor of Drama and of  
English and Comparative Literature

*Harvard University*

**David Damrosch**

Ernest Bernbaum Professor of Literature  
*Harvard University*



Verified Certificate

Issued July 27, 2021

Valid Certificate ID

**a99c19495864446a8b0a284535fc6b1c**

# Verified Certificate

HarvardX

This is to certify that

## Sourav Kundu

successfully completed and received a passing grade in

### HUM12x: Masterpieces of World Literature

a course of study offered by HarvardX, an online learning initiative of Harvard University.



Martin Puchner

Byron and Anita Wien Professor of Drama and of English and  
Comparative Literature

*Harvard University*



David Damrosch

Ernest Bernbaum Professor of Literature

*Harvard University*



Verified Certificate

April 22, 2022

Valid Certificate ID

[9c93fdd72ec1467dbd40b2f0c80d92ba](#)



# Verified Certificate



**Clyde Seepersad**

SVP & General Manager, Training and Certification

*The Linux Foundation*

This is to certify that

**SOUMABHA BANERJEE**

successfully completed and received a passing grade in

**LFS110x: Business Considerations for 5G with  
Edge, IoT, and AI**

a course of study offered by LinuxFoundationX, an online  
learning initiative of The Linux Foundation.



**Verified Certificate**  
Issued July 21, 2021

**Valid Certificate ID**  
[a175d7a4e6a6427fafcd88083a82909a](https://courses.edx.org/certificates/a175d7a4e6a6427fafcd88083a82909a)

# Verified Certificate



**Rav Ahuja**

AI and Data Science Program Director

IBM

**Upkar Lidder**

Senior Developer Advocate

IBM

This is to certify that

**Asish Samanta**

successfully completed and received a passing grade in

**CAD101EN: Introduction to Cloud Development  
with HTML, CSS, and JavaScript**

a course of study offered by IBM, an online learning  
initiative of IBM.



**Verified Certificate**  
Issued April 28, 2022

**Valid Certificate ID**  
[e2fc3b2ba31c4b709942c857f8d15afd](https://courses.edx.org/certificates/e2fc3b2ba31c4b709942c857f8d15afd)



Certificate no: UC-34fd2625-2d49-402e-b06d-93fe2217d270

Certificate url: [ude.my/UC-34fd2625-2d49-402e-b06d-93fe2217d270](https://ude.my/UC-34fd2625-2d49-402e-b06d-93fe2217d270)

Reference Number: 0004

CERTIFICATE OF COMPLETION

# Java Programming Masterclass covering Java 11 & Java 17

Instructors **Tim Buchalka, Tim Buchalka's Learn Programming Academy**

## Rajdeep Ghosh

Date **May 10, 2022**

Length **80.5 total hours**



Certificate no: UC-c1e82662-4aea-43f6-89de-a5f40d45017c

Certificate url: [ude.my/UC-c1e82662-4aea-43f6-89de-a5f40d45017c](https://ude.my/UC-c1e82662-4aea-43f6-89de-a5f40d45017c)

Reference Number: 0004

CERTIFICATE OF COMPLETION

# The Complete 2022 Web Development Bootcamp

Instructors **Dr. Angela Yu**

## Parthib Kumar Sarkar

Date **April 28, 2022**

Length **65.5 total hours**

# Verified Certificate

ColumbiaX



Elsa Stamatopoulou

Director, Indigenous Peoples' Rights Program, Institute for the  
Study of Human Rights

*Columbia University*

This is to certify that

**MD TAUSIF**

successfully completed and received a passing grade in

**IPR: Indigenous Peoples' Rights**

a course of study offered by ColumbiaX, an online learning  
initiative of Columbia University.



**Verified Certificate**  
Issued July 20, 2021

**Valid Certificate ID**  
[f910b36219fb4516ba9abd809557e38d](#)

# Verified Certificate



A handwritten signature in black ink, appearing to read "Clyde Seepersad".

Clyde Seepersad

SVP & General Manager, Training & Certification

*The Linux Foundation*

This is to certify that

**Neha Prasad**

successfully completed and received a passing grade in

**LFS158x: Introduction to Kubernetes**

a course of study offered by LinuxFoundationX, an online learning initiative of The Linux Foundation.



**Verified Certificate**  
Issued April 28, 2022

**Valid Certificate ID**  
[db86d416c11f4d6e8cc14c041fd2e120](https://courses.edx.org/certificates/db86d416c11f4d6e8cc14c041fd2e120)

**Verified**  
**Certificate**



A handwritten signature in black ink, appearing to read 'Clyde Seepersad'.

**Clyde Seepersad**

SVP & General Manager, Training & Certification

*The Linux Foundation*

This is to certify that

**Neha Prasad**

successfully completed and received a passing grade in

**LFS170x: Blockchain: Understanding Its Uses  
and Implications**

a course of study offered by LinuxFoundationX, an online  
learning initiative of The Linux Foundation.



**Verified Certificate**  
Issued April 28, 2022

**Valid Certificate ID**  
[e0d56f25f050496192d45d7b774c9258](https://courses.edx.org/certificates/e0d56f25f050496192d45d7b774c9258)

This certificate is computer generated and can be verified by scanning the QR code given below. This will display the certificate from the NPTEL repository, <https://nptel.ac.in/noc/>

Roll No: NPTEL21CE56S13020031

To  
SRAYA DEBNATH  
352,OLAICHANDI TALA COLONY  
P.O. & DIST - HOOGHLY  
CHINSURAH  
WEST BENGAL - 712103  
PH. NO :8777835008



Score	Type of Certificate
>=90	Elite+Gold
75-89	Elite+Silver
>=60	Elite
40-59	Successfully Completed
<40	No Certificate

No. of credits recommended by NPTEL:3

An additional 1 credit may be awarded if the University deems it fit, based on the actual student effort involved.



# NPTEL Online Certification

(Funded by the Ministry of HRD, Govt. of India)



This certificate is awarded to

**SRAYA DEBNATH**

for successfully completing the course

**Fluid Mechanics**

with a consolidated score of **57** %

Online Assignments	22.35/25	Proctored Exam	34.85/75
--------------------	----------	----------------	----------

Total number of candidates certified in this course: **101**

Jul-Oct 2021  
(12 week course)

**Prof. Hemant B Kaushik**  
Head, Center for Educational Technology  
NPTEL Coordinator, IIT Guwahati



Indian Institute of Technology Guwahati





# Verified Certificate

# ColumbiaX



**Robert A. F. Thurman**

Jey Tsong Khapa Professor of Indo-Tibetan Studies

*Columbia University*

This is to certify that

**Avi Shee**

successfully completed and received a passing grade in

**BUDDHA1x: Indian & Tibetan River of Buddhism**

a course of study offered by ColumbiaX, an online learning initiative of Columbia University.



**Verified Certificate**  
Issued October 18, 2021

**Valid Certificate ID**  
[35d0893ce99f44b3b619544cf0eb92da](https://courses.edx.org/certificates/35d0893ce99f44b3b619544cf0eb92da)



Certificate no: UC-143e79b0-b0dd-4256-9b61-928c55a32095

Certificate url: [ude.my/UC-143e79b0-b0dd-4256-9b61-928c55a32095](https://ude.my/UC-143e79b0-b0dd-4256-9b61-928c55a32095)

Reference Number: 0004

CERTIFICATE OF COMPLETION

# Digital Marketing B2B Ultimate Digital Marketing Course 2023

Instructors **Dekker Fraser, MBA, Jyra Galosmo**

## Jyotiranjana Dey

Date **2 Apr 2023**

Length **49.5 total hours**



Certificate no: UC-2a925082-675c-4933-bbe0-3eb7e61b8999

Certificate url: [ude.my/UC-2a925082-675c-4933-bbe0-3eb7e61b8999](https://udemy.com/UC-2a925082-675c-4933-bbe0-3eb7e61b8999)

Reference Number: 0004

CERTIFICATE OF COMPLETION

# SEO Training: Complete SEO Course & SEO Copywriting MASTERY

Instructors **Ing. Tomas Moravek | Facebook Ads Expert, SEO, Facebook Ads & Digital Marketing Academy, Beck Robertson**

## Pronoy Chatterjee

Date **Feb. 7, 2023**

Length **38.5 total hours**



Certificate no: UC-7986b0cc-7b79-4082-96b0-cd3efec48268

Certificate url: ude.my/UC-7986b0cc-7b79-4082-96b0-cd3efec48268

Reference Number: 0004

CERTIFICATE OF COMPLETION

# Project Development Using JAVA for Beginners - 2022

Instructors **Hemanth kumar**

## Debaditya Sarkar

Date **July 18, 2022**

Length **45.5 total hours**



Certificate no: UC-21f3bd47-f577-42ee-980b-9e1b91906fd7

Certificate url: [ude.my/UC-21f3bd47-f577-42ee-980b-9e1b91906fd7](https://ude.my/UC-21f3bd47-f577-42ee-980b-9e1b91906fd7)

Reference Number: 0004

CERTIFICATE OF COMPLETION

# Front End Web Development Ultimate Guide

Instructors **Josh Werner, Learn Tecc**

## **Avishek Bhattacharjee**

Date **Feb. 16, 2023**

Length **92.5 total hours**



Certificate no: UC-3868c78d-e4ab-4b6e-8883-0a32661779e6  
Certificate url: [ude.my/UC-3868c78d-e4ab-4b6e-8883-0a32661779e6](https://ude.my/UC-3868c78d-e4ab-4b6e-8883-0a32661779e6)  
Reference Number: 0004

CERTIFICATE OF COMPLETION

# Digital Marketing B2B Ultimate Digital Marketing Course 2023

Instructors **Dekker Fraser, MBA, Jyra Galosmo**

## Sougata Pal

Date **May 7, 2023**

Length **49.5 total hours**



Certificate no: UC-8d09b524-5676-423f-836e-852c48238fec  
Certificate url: [ude.my/UC-8d09b524-5676-423f-836e-852c48238fec](https://ude.my/UC-8d09b524-5676-423f-836e-852c48238fec)  
Reference Number: 0004

CERTIFICATE OF COMPLETION

# The Complete 2023 Web Development Bootcamp

Instructors **Dr. Angela Yu**

## Sourav Bain

Date **April 26, 2023**

Length **65.5 total hours**



Certificate no: UC-2b873702-3838-4b08-86bf-5f94e84fc438

Certificate url: [ude.my/UC-2b873702-3838-4b08-86bf-5f94e84fc438](https://ude.my/UC-2b873702-3838-4b08-86bf-5f94e84fc438)

Reference Number: 0004

CERTIFICATE OF COMPLETION

# How the Internet Works & the Web Development Process

Instructors **YouAccel Training**

## Aritri Chakraborty

Date **Dec. 3, 2022**

Length **37 total mins**





Certificate no: UC-b50ba9b3-cdde-4e4b-9ac4-b3e234a4fddc

Certificate url: [ude.my/UC-b50ba9b3-cdde-4e4b-9ac4-b3e234a4fddc](https://ude.my/UC-b50ba9b3-cdde-4e4b-9ac4-b3e234a4fddc)

Reference Number: 0004

CERTIFICATE OF COMPLETION

# Project Development Using JAVA for Beginners - 2023

Instructors **Hemanth kumar**

**Saklin Sk**

Date **Jan. 25, 2023**

Length **45.5 total hours**



Certificate no: UC-441abd97-abab-43d7-b1dd-6c91624c535f

Certificate url: [ude.my/UC-441abd97-abab-43d7-b1dd-6c91624c535f](https://ude.my/UC-441abd97-abab-43d7-b1dd-6c91624c535f)

Reference Number: 0004

CERTIFICATE OF COMPLETION

# The Complete Flutter Development Guide [2022 Edition]

Instructors **Hassan Fulaih**

## Ankush Khamaru

Date **Feb. 1, 2023**

Length **71.5 total hours**

**Verified**  
**Certificate**



A handwritten signature in black ink, appearing to read "Clyde Seepersad".

**Clyde Seepersad**

SVP & General Manager, Training & Certification

*The Linux Foundation*

This is to certify that

**Satyam Ghosh**

successfully completed and received a passing grade in

**LFS165x: Introduction to Open Source  
Networking Technologies**

a course of study offered by LinuxFoundationX, an online  
learning initiative of The Linux Foundation.



**Verified Certificate**

Issued May 15, 2023

**Valid Certificate ID**

[098cb0a21a09450ab2ae63558d4253dd](#)



Certificate no: UC-bc1fd540-9095-4067-8f4f-f65954391e61

Certificate url: [ude.my/UC-bc1fd540-9095-4067-8f4f-f65954391e61](https://ude.my/UC-bc1fd540-9095-4067-8f4f-f65954391e61)

Reference Number: 0004

CERTIFICATE OF COMPLETION

# SEO Training: Complete SEO Course & SEO Copywriting MASTERY

Instructors **Ing. Tomas Moravek, SEO, Facebook Ads & Digital Marketing Academy, Beck Robertson**

**Subham Dinda**

Date **Feb. 15, 2023**

Length **38.5 total hours**

**coursera**  
project  
network

Mar 11, 2023

# Suman Mondal

has successfully completed

## Create a Profile and Network on LinkedIn

an online non-credit project authorized by Coursera Project Network and offered through  
Coursera



Heidi Barker  
Subject Matter Expert  
Freedom Learning Group

PROJECT  
CERTIFICATE



Verify at:  
<https://coursera.org/verify/PZKLF6GME2HH>

Coursera has confirmed the identity of this individual and their  
participation in the project.



Certificate no: UC-c05dfe7a-433b-408c-bb43-1c5b77776b4  
Certificate url: ude.my/UC-c05dfe7a-433b-408c-bb43-1c5b77776b4  
Reference Number: 0004

CERTIFICATE OF COMPLETION

# Adobe Creative Cloud Ultimate Guide

Instructors **Josh Werner, Learn Tecc**

**Liza Bhattacharjee**

Date **Feb. 11, 2023**

Length **33.5 total hours**

**Verified**  
Certificate



A handwritten signature in black ink, appearing to read 'Maureen Lonergan'.

Maureen Lonergan  
Director, Training and Certification  
Amazon Web Services (AWS)

This is to certify that

**Hrithick Biswas**

successfully completed and received a passing grade in

**AWS-OTP-AWSD15: AWS Cloud Practitioner  
Essentials**

a course of study offered by AWS, an online learning  
initiative of AWS.



Verified Certificate  
Issued May 12, 2023

Valid Certificate ID  
[e2224c8edd2049f487ee7b99fd242618](#)

# Verified Certificate



A handwritten signature in black ink that reads 'Coreen Ryskamp'.

Coreen Ryskamp

Program Manager, IBM Security Learning Services

IBM

This is to certify that

**Hrithick Biswas**

successfully completed and received a passing grade in

**Cybfun.1.0: Cybersecurity Basics**

a course of study offered by IBM, an online learning initiative of IBM.



**Verified Certificate**  
Issued April 29, 2023

**Valid Certificate ID**  
[7030b055502a486091ad12e545326b34](#)





Certificate no: UC-d2f3b037-e798-49ea-ab5d-ade584ae967e

Certificate url: [ude.my/UC-d2f3b037-e798-49ea-ab5d-ade584ae967e](https://ude.my/UC-d2f3b037-e798-49ea-ab5d-ade584ae967e)

Reference Number: 0004

CERTIFICATE OF COMPLETION

# Machine Learning & Deep Learning in Python & R

Instructors **Start-Tech Academy**

## Nilimesh Ghosh

Date **March 16, 2023**

Length **33 total hours**



Certificate no: UC-ff7038eb-6dad-4c4b-8bd1-9e3aaf68d4eb

Certificate url: [ude.my/UC-ff7038eb-6dad-4c4b-8bd1-9e3aaf68d4eb](https://ude.my/UC-ff7038eb-6dad-4c4b-8bd1-9e3aaf68d4eb)

Reference Number: 0004

CERTIFICATE OF COMPLETION

# The Web Developer Bootcamp 2023

Instructors **Colt Steele**

## Kanishka Gupta

Date **May 21, 2023**

Length **74 total hours**



# Declaration of Completion

**Abir Dutta**

has successfully completed the online course:

**Getting started with NodeJS**

This professional has demonstrated initiative and a commitment to deepening their skills and advancing their career. Well done!

31<sup>st</sup> Aug 2022

Certificate code : 3735191

**Krishna Kumar**  
CEO



# Declaration of Completion

**Abir Dutta**

has successfully completed the online course:

**Introduction to Data Science**

This professional has demonstrated initiative and a commitment to deepening their skills and advancing their career. Well done!

17<sup>th</sup> Jan 2023

Certificate code : 4098312

**Krishna Kumar**  
CEO



Certificate no: UC-7dc94ebc-b52d-483d-9bae-c6e302845e66

Certificate url: [ude.my/UC-7dc94ebc-b52d-483d-9bae-c6e302845e66](https://ude.my/UC-7dc94ebc-b52d-483d-9bae-c6e302845e66)

Reference Number: 0004

CERTIFICATE OF COMPLETION

# DevOps Beginners to Advanced | Decoding DevOps with Projects

Instructors **Imran Teli**

## Sayantana Ghosh

Date **May 27, 2023**

Length **49 total hours**



Certificate no: UC-068a550a-f22a-4bb9-a68b-959aebc58c9f

Certificate url: [ude.my/UC-068a550a-f22a-4bb9-a68b-959aebc58c9f](https://ude.my/UC-068a550a-f22a-4bb9-a68b-959aebc58c9f)

Reference Number: 0004

CERTIFICATE OF COMPLETION

# Ultimate AWS Certified Developer Associate 2023 NEW DVA-C02

Instructors **Stephane Maarek | AWS Certified Cloud Practitioner, Solutions Architect, Developer**

## Sayantana Ghosh

Date **May 18, 2023**

Length **34 total hours**



Certificate no: UC-bc84b371-1869-4804-82c9-23a265aa7b2f

Certificate url: [ude.my/UC-bc84b371-1869-4804-82c9-23a265aa7b2f](https://ude.my/UC-bc84b371-1869-4804-82c9-23a265aa7b2f)

Reference Number: 0004

CERTIFICATE OF COMPLETION

# The Complete 2023 Web Development Bootcamp

Instructors **Dr. Angela Yu**

## Sayantana Ghosh

Date **May 13, 2023**

Length **65.5 total hours**



Certificate no: UC-1e6ba3c6-9c95-49f2-942b-6ba883c99238  
Certificate url: [ude.my/UC-1e6ba3c6-9c95-49f2-942b-6ba883c99238](https://ude.my/UC-1e6ba3c6-9c95-49f2-942b-6ba883c99238)  
Reference Number: 0004

CERTIFICATE OF COMPLETION

# Der Komplette Excel Kurs - Vom Anfänger zum Profi in 50h

Instructors **Sebastian Glöckner, Sebastian Glöckner Karriere-Entwicklung, Sebastian Glöckner Support**

**Shahil Maji**

Date **May 29, 2023**

Length **62.5 total hours**





Certificate no: UC-3a88f4f3-938a-42b7-a359-6311a1a5b264

Certificate url: [ude.my/UC-3a88f4f3-938a-42b7-a359-6311a1a5b264](https://ude.my/UC-3a88f4f3-938a-42b7-a359-6311a1a5b264)

Reference Number: 0004

CERTIFICATE OF COMPLETION

# Complete AutoCAD 2D + 3D Course in HINDI

Instructors **Er. Muktar Ansari**

## Shahil Maji

Date **May 15, 2023**

Length **52.5 total hours**



Certificate no: UC-ae8cc01-5209-4dcb-8dc0-14605c742646

Certificate url: [ude.my/UC-ae8cc01-5209-4dcb-8dc0-14605c742646](https://ude.my/UC-ae8cc01-5209-4dcb-8dc0-14605c742646)

Reference Number: 0004

CERTIFICATE OF COMPLETION

# Android Java Masterclass - Become an App Developer

Instructors **Tim Buchalka, Jean-Paul Roberts, Tim Buchalka's Learn Programming Academy**

## Abhishek Manna

Date **1 Feb 2023**

Length **60.5 total hours**



Certificate no: UC-1707af4e-3f33-400d-8b16-9a98c41bfc1a

Certificate url: [ude.my/UC-1707af4e-3f33-400d-8b16-9a98c41bfc1a](https://ude.my/UC-1707af4e-3f33-400d-8b16-9a98c41bfc1a)

Reference Number: 0004

CERTIFICATE OF COMPLETION

# Machine Learning & Deep Learning in Python & R

Instructors **Start-Tech Academy**

## Trisha Roy

Date **March 16, 2023**

Length **33 total hours**



Certificate no: UC-efa73c63-23cf-490d-bc99-cf8927fb1fd3

Certificate url: ude.my/UC-efa73c63-23cf-490d-bc99-cf8927fb1fd3

Reference Number: 0004

CERTIFICATE OF COMPLETION

# Best of Facebook Ads: Facebook Ads 2023 Ultimate Pro Edition

Instructors **Ing. Tomas Moravek | Facebook Ads Expert, SEO, Facebook Ads & Digital Marketing Academy, Beck Robertson**

## **Bidisha Manna**

Date **Feb. 12, 2023**

Length **32.5 total hours**



Certificate no: UC-39b789e8-3fb0-4708-97bd-cc90370f0467  
Certificate url: [ude.my/UC-39b789e8-3fb0-4708-97bd-cc90370f0467](https://ude.my/UC-39b789e8-3fb0-4708-97bd-cc90370f0467)  
Reference Number: 0004

CERTIFICATE OF COMPLETION

# Digital Marketing B2B Ultimate Digital Marketing Course 2023

Instructors **Dekker Fraser, MBA, Jyra Galosmo**

## Vijay Kumar Singh

Date **May 8, 2023**

Length **49.5 total hours**

**Verified**  
**Certificate**



A handwritten signature in black ink, appearing to read "Clyde Seepersad".

**Clyde Seepersad**

SVP & General Manager, Training & Certification

*The Linux Foundation*

This is to certify that

**Poushali Manna**

successfully completed and received a passing grade in

**LFS162x: Introduction to DevOps and Site Reliability Engineering**

a course of study offered by LinuxFoundationX, an online learning initiative of The Linux Foundation.



**Verified Certificate**  
Issued January 19, 2023

**Valid Certificate ID**  
[60c7e2d32c7749fca01d94ffee4a53f6](https://courses.edx.org/certificates/60c7e2d32c7749fca01d94ffee4a53f6)



Certificate no: UC-65eae5af-44b1-4032-829e-4f01f65d86a3

Certificate url: [ude.my/UC-65eae5af-44b1-4032-829e-4f01f65d86a3](https://ude.my/UC-65eae5af-44b1-4032-829e-4f01f65d86a3)

Reference Number: 0004

CERTIFICATE OF COMPLETION

# HTML-CSS-JavaScript: Desde la nada al máximo

Instructors **Vladimir Rodríguez**

## Tuhin Subhra Sinha

Date **May 5, 2023**

Length **81.5 total hours**



Certificate no: UC-83931070-f335-4cd9-bcef-4cc8d6854982

Certificate url: [ude.my/UC-83931070-f335-4cd9-bcef-4cc8d6854982](https://ude.my/UC-83931070-f335-4cd9-bcef-4cc8d6854982)

Reference Number: 0004

CERTIFICATE OF COMPLETION

# Corporate Finance

Instructors **Robert (Bob) Steele**

## Ayan Mondal

Date **May 16, 2023**

Length **163.5 total hours**





Certificate no: UC-f25bbaf6-a601-4f72-bcb5-b703c8db0552

Certificate url: [ude.my/UC-f25bbaf6-a601-4f72-bcb5-b703c8db0552](https://ude.my/UC-f25bbaf6-a601-4f72-bcb5-b703c8db0552)

Reference Number: 0004

CERTIFICATE OF COMPLETION

# QuickBooks Desktop vs. Excel

Instructors **Robert (Bob) Steele**

## Shreya Roy

Date **May 8, 2023**

Length **128 total hours**



Certificate no: UC-5b36e41d-4be1-40a4-b6c8-05de4b0b1872

Certificate url: [ude.my/UC-5b36e41d-4be1-40a4-b6c8-05de4b0b1872](https://ude.my/UC-5b36e41d-4be1-40a4-b6c8-05de4b0b1872)

Reference Number: 0004

CERTIFICATE OF COMPLETION

# Managerial Accounting / Cost Accounting

Instructors **Robert (Bob) Steele**

## Soumabha Banerjee

Date **May 11, 2023**

Length **53.5 total hours**

# Verified Certificate

This is to certify that

**Krishanu China**

successfully completed and received a passing grade in

**LFS151.x: Introduction to Cloud Infrastructure Technologies**

a course of study offered by LinuxFoundationX, an online learning initiative of The Linux Foundation.



A handwritten signature in black ink, appearing to read 'Clyde Seepersad'.

**Clyde Seepersad**

General Manager, Training & Certification  
The Linux Foundation



Verified Certificate  
Issued March 18, 2023

Valid Certificate ID  
841159e6ccb64b19b6322898bce4a761



Certificate no: UC-037ff0ac-8082-49eb-aae8-fe02482c532b  
Certificate url: [ude.my/UC-037ff0ac-8082-49eb-aae8-fe02482c532b](https://ude.my/UC-037ff0ac-8082-49eb-aae8-fe02482c532b)  
Reference Number: 0004

CERTIFICATE OF COMPLETION

# Advanced Financial Accounting

Instructors **Robert (Bob) Steele**

## Sandipan Pal

Date **May 16, 2023**

Length **63.5 total hours**



Certificate no: UC-2f4a7db8-e9d5-422f-a431-f171116a4db7

Certificate url: [ude.my/UC-2f4a7db8-e9d5-422f-a431-f171116a4db7](https://ude.my/UC-2f4a7db8-e9d5-422f-a431-f171116a4db7)

Reference Number: 0004

CERTIFICATE OF COMPLETION

# Android Java Masterclass - Become an App Developer

Instructors **Tim Buchalka, Jean-Paul Roberts, Tim Buchalka's Learn Programming Academy**

## Rajdeep Ghosh

Date **April 30, 2023**

Length **60.5 total hours**

# Verified Certificate



A handwritten signature in black ink, appearing to read "Maureen Lonergan".

Maureen Lonergan  
Director, Training and Certification  
Amazon Web Services (AWS)

This is to certify that

**ARGHYA CHAKRABORTY**

successfully completed and received a passing grade in

**AWS-OTP-AWSD15: AWS Cloud Practitioner  
Essentials**

a course of study offered by AWS, an online learning  
initiative of AWS.



Verified Certificate  
Issued May 7, 2023

Valid Certificate ID  
[97855629bd064b8b8ba8143f50696373](https://courses.edx.org/certificates/97855629bd064b8b8ba8143f50696373)



Certificate no: UC-0d079673-4b99-4471-8570-aa050989f7ed

Certificate url: [ude.my/UC-0d079673-4b99-4471-8570-aa050989f7ed](https://ude.my/UC-0d079673-4b99-4471-8570-aa050989f7ed)

Reference Number: 0004

CERTIFICATE OF COMPLETION

# JavaScript Programming

Instructors **Uplatz Training**

## Parthib Kumar Sarkar

Date **April 6, 2023**

Length **33 total hours**

# Verified Certificate



This is to certify that

**MD TAUSIF**

successfully completed and received a passing grade in

**LFS101x: Introduction to Linux**

a course of study offered by LinuxFoundationX, an online learning initiative of The Linux Foundation.

A handwritten signature in black ink, appearing to read 'Clyde Seepersad'.

Clyde Seepersad

SVP & General Manager, Training & Certification

*The Linux Foundation*



**Verified Certificate**

Issued May 13, 2023

**Valid Certificate ID**

[af8e28cefa424189a5bc7517658780ed](#)



# Verified Certificate



A handwritten signature in grey ink, appearing to read "Rafael Irizarry".

Rafael Irizarry

Professor of Biostatistics

*Harvard T.H. Chan School of Public Health*

This is to certify that

**Neha Prasad**

successfully completed and received a passing grade in

**PH125.3x: Data Science: Probability**

a course of study offered by HarvardX, an online learning initiative of Harvard University.



**Verified Certificate**  
Issued May 13, 2023

**Valid Certificate ID**  
[1866ee6ca8e54d8abc7ddc3706c2f3fd](https://courses.edx.org/certificates/1866ee6ca8e54d8abc7ddc3706c2f3fd)



Certificate no: UC-bf40b72d-e29f-4f80-9681-4c099f11fee9

Certificate url: [ude.my/UC-bf40b72d-e29f-4f80-9681-4c099f11fee9](https://ude.my/UC-bf40b72d-e29f-4f80-9681-4c099f11fee9)

Reference Number: 0004

CERTIFICATE OF COMPLETION

# Android App Development in 33 Hours Bootcamp | Android 13

Instructors **OCSALY Academy** | 180.000+ Students

## Subhankar Pal

Date **March 23, 2023**

Length **33 total hours**

# Verified Certificate



A handwritten signature in blue ink, appearing to read "Clyde Seepersad".

**Clyde Seepersad**

SVP and General Manager, Training & Certification

*The Linux Foundation*

This is to certify that

**SOUVIK SARKAR**

successfully completed and received a passing grade in

**LFS167x: Introduction to Jenkins**

a course of study offered by LinuxFoundationX, an online learning initiative of The Linux Foundation.



**Verified Certificate**

Issued May 3, 2023

**Valid Certificate ID**

[5db7403c1ba64e1398f49e4fb3fff093](https://courses.edx.org/certificates/5db7403c1ba64e1398f49e4fb3fff093?_gl=1*1trksn*_ga*MTEyMzQwOTMyNS4xNjgzMTI1NDIy*_ga_D3KS4KMDT0*MTY4MzEyNTQyMi4xLjEuMTY4MzEyODQ5NC4...)



Certificate no: UC-c70b545e-6f23-4508-a6ac-ea7902fac964

Certificate url: [ude.my/UC-c70b545e-6f23-4508-a6ac-ea7902fac964](https://ude.my/UC-c70b545e-6f23-4508-a6ac-ea7902fac964)

Reference Number: 0004

CERTIFICATE OF COMPLETION

# Real Estate Investment & Finance

Instructors **Robert (Bob) Steele**

## Swarnava Ghosh

Date **May 14, 2023**

Length **44 total hours**



Roll No:NPTEL18HS30S11090599

To

HOOGHLY ENGINEERING & TECHNOLOGY COLLEGE  
HOOGHLY

16/2125



Score	Type of Certificate
>=90	Elite + Gold Medal
60-89	Elite
40-59	Successfully Completed the course
<40	No Certificate

No. of credits recommended by NPTEL:2



Elite

# NPTEL Online Certification

(Funded by the Ministry of HRD, Govt. of India)



This certificate is awarded to

**ARITRY SAMADDAR**

for successfully completing the course

**Developing Soft Skills and Personality**

with a consolidated score of **73 %**

Online Assignments	24.33/25	Proctored Exam	48.75/75
--------------------	----------	----------------	----------

Total number of candidates certified in this course: **12219**

*T V Prabhakar*

Prof. T. V. Prabhakar  
Chairman  
Center for Continuing Education, IITK

Aug-Oct 2018  
(8 week course)

*Satyaki Roy*

Prof. Satyaki Roy  
NPTEL Coordinator  
IIT Kanpur



Indian Institute of Technology Kanpur





Roll No:NPTEL18HS27S11330080

To

HOOGHLY ENGINEERING & TECHNOLOGY COLLEGE  
HOOGHLY

1/2125



Score	Type of Certificate
>=90	Elite + Gold Medal
60-89	Elite
40-59	Successfully Completed the course
<40	No Certificate

No. of credits recommended by NPTEL:2



# NPTEL Online Certification

(Funded by the Ministry of HRD, Govt. of India)



This certificate is awarded to

**SOHAM DATTA**

for successfully completing the course

**Technical English for Engineers**

with a consolidated score of **55 %**

Online Assignments	11.25/25	Proctored Exam	43.5/75
--------------------	----------	----------------	---------

Total number of candidates certified in this course: **1874**

Prof. A. Ramesh  
Chairman  
Center for Continuing Education, IITM

Aug-Sep 2018  
(8 week course)

Prof. Andrew Thangaraj  
NPTEL Coordinator  
IIT Madras



Indian Institute of Technology Madras





Roll No:NPTEL18CS35S21360478

To

HOOGHLY ENGINEERING & TECHNOLOGY COLLEGE  
HOOGHLY

190/2125



Score	Type of Certificate
>=90	Elite + Gold Medal
60-89	Elite
40-59	Successfully Completed the course
<40	No Certificate

No. of credits recommended by NPTEL:3



Elite

# NPTEL Online Certification

(Funded by the Ministry of HRD, Govt. of India)



This certificate is awarded to

**DEB KUMAR DAS**

for successfully completing the course

**The Joy of Computing Using Python**

with a consolidated score of **86 %**

Online Assignments	23.25/25	Proctored Exam	63/75
--------------------	----------	----------------	-------

Total number of candidates certified in this course: **4045**

Prof. A. Ramesh  
Chairman  
Center for Continuing Education, IITM

Jul-Oct 2018  
(12 week course)

Prof. Andrew Thangaraj  
NPTEL Coordinator  
IIT Madras



Indian Institute of Technology Madras





Roll No: NPTEL19ME10S31430138

To  
HOOGHLY ENGINEERING & TECHNOLOGY COLLEGE  
HOOGHLY

1/2125



Score	Type of Certificate
>=90	Elite+Gold
75-89	Elite+Silver
>=60	Elite
40-59	Successfully completed the course
<40	No Certificate

No. of credits recommended by NPTEL:3



# NPTEL Online Certification

(Funded by the Ministry of HRD, Govt. of India)



This certificate is awarded to

**SAYANTAN SENGUPTA**

for successfully completing the course

## IC Engines and Gas Turbines

with a consolidated score of **42** %

Online Assignments	19.16/25	Proctored Exam	22.5/75
--------------------	----------	----------------	---------

Total number of candidates certified in this course: 1557

Prof. Sunil Khijwania  
Head, Center for Educational Technology  
NPTEL Coordinator, IIT Guwahati

Jan-Apr 2019  
(12 week course)



Indian Institute of Technology Guwahati







Roll No: NPTEL19MA15S31430210

To  
HOOGHLY ENGINEERING & TECHNOLOGY COLLEGE  
HOOGHLY

1/2125



Score	Type of Certificate
>=90	Elite+Gold
75-89	Elite+Silver
>=60	Elite
40-59	Successfully completed the course
<40	No Certificate

No. of credits recommended by NPTEL:3



# NPTEL Online Certification

(Funded by the Ministry of HRD, Govt. of India)



This certificate is awarded to

**ABHINANDAN THAKUR**

for successfully completing the course

## Introduction to Automata, Languages and Computation

with a consolidated score of **40** %

Online Assignments	13.59/25	Proctored Exam	25.94/75
--------------------	----------	----------------	----------

Total number of candidates certified in this course: 850

Jan-Apr 2019  
(12 week course)

A. Goswami  
Prof. Adrijit Goswami  
Dean, Continuing Education & NPTEL Coordinator  
IIT Kharagpur



Indian Institute of Technology Kharagpur





Roll No: NPTEL19EE18S51430046

To  
HOOGHLY ENGINEERING & TECHNOLOGY COLLEGE  
HOOGHLY

1/2125



Score	Type of Certificate
>=90	Elite+Gold
75-89	Elite+Silver
>=60	Elite
40-59	Successfully completed the course
<40	No Certificate

No. of credits recommended by NPTEL:1



**Elite**

# NPTEL Online Certification

(Funded by the Ministry of HRD, Govt. of India)



This certificate is awarded to  
**ANKIT BHARDWAJ**  
for successfully completing the course

## Electric Vehicles - Part 1

with a consolidated score of **66** %

Online Assignments	22.50/25	Proctored Exam	43.5/75
--------------------	----------	----------------	---------

Total number of candidates certified in this course: 1926

Prof. A. Ramesh  
Chairman  
Centre for Continuing Education, IITM

Feb-Mar 2019  
(4 week course)

Prof. Andrew Thangaraj  
NPTEL Coordinator  
IIT Madras



Indian Institute of Technology Madras





Roll No: NPTEL19EE10S21340021

To

SUMONA KARMAKAR  
SABINARA BYE LANE P.O - CHANDANNAGAR  
CHANDANNAGAR  
HOOGHLY  
WEST BENGAL  
712136  
PH. NO :9007690465



Score	Type of Certificate
>=90	Elite+Gold
75-89	Elite+Silver
>=60	Elite
40-59	Successfully completed the course
<40	No Certificate

No. of credits recommended by NPTEL:2



# NPTEL Online Certification

(Funded by the Ministry of HRD, Govt. of India)



This certificate is awarded to

**SUMONA KARMAKAR**

for successfully completing the course

## Analog Circuits

with a consolidated score of **53** %

Online Assignments	16.83/25	Proctored Exam	36/75
--------------------	----------	----------------	-------

Total number of candidates certified in this course: **653**

Prof. Sridhar Iyer  
Head CDEEP & NPTEL Coordinator  
IIT Bombay

Jan-Mar 2019  
(8 week course)



Indian Institute of Technology Bombay





Roll No: NPTEL19EE09S31430165

To  
HOOGHLY ENGINEERING & TECHNOLOGY COLLEGE  
HOOGHLY

Score	Type of Certificate
>=90	Elite+Gold
75-89	Elite+Silver
>=60	Elite
40-59	Successfully completed the course
<40	No Certificate

1/2125



No. of credits recommended by NPTEL:3



# NPTEL Online Certification

(Funded by the Ministry of HRD, Govt. of India)



This certificate is awarded to

**SOURAV ROY**

for successfully completing the course

## Digital Electronic Circuits

with a consolidated score of **40** %

Online Assignments	12.84/25	Proctored Exam	27.5/75
--------------------	----------	----------------	---------

Total number of candidates certified in this course: 922

Jan-Apr 2019  
(12 week course)

*A. Goswami*  
Prof. Adrijit Goswami  
Dean, Continuing Education & NPTEL Coordinator  
IIT Kharagpur



Indian Institute of Technology Kharagpur





Roll No: NPTEL19EE04S61430016

To  
HOOGHLY ENGINEERING & TECHNOLOGY COLLEGE  
HOOGHLY

1/2125



Score	Type of Certificate
>=90	Elite+Gold
75-89	Elite+Silver
>=60	Elite
40-59	Successfully completed the course
<40	No Certificate

No. of credits recommended by NPTEL:3



# NPTEL Online Certification

(Funded by the Ministry of HRD, Govt. of India)



This certificate is awarded to  
**SUMONA KARMAKAR**  
for successfully completing the course

## Fundamentals of Semiconductor Devices

with a consolidated score of **40** %

Online Assignments	14.69/25	Proctored Exam	25/75
--------------------	----------	----------------	-------

Total number of candidates certified in this course: 325

Prof. G. L. Sivakumar Babu  
Chairman, Center for Continuing Education  
IISc Bangalore

Jan-Apr 2019  
(12 week course)

Prof. L. Umanand  
NPTEL Coordinator  
IISc Bangalore



Indian Institute of Science Bangalore





Roll No: NPTEL19EE02S41430016

To  
HOOGHLY ENGINEERING & TECHNOLOGY COLLEGE  
HOOGHLY

1/2125



Score	Type of Certificate
>=90	Elite+Gold
75-89	Elite+Silver
>=60	Elite
40-59	Successfully completed the course
<40	No Certificate

No. of credits recommended by NPTEL:3



# NPTEL Online Certification

(Funded by the Ministry of HRD, Govt. of India)



This certificate is awarded to

**SUDIP KUMAR ADHIKARY**

for successfully completing the course

## Power System Engineering

with a consolidated score of **45** %

Online Assignments	16.03/25	Proctored Exam	28.5/75
--------------------	----------	----------------	---------

Total number of candidates certified in this course: 509

Jan-Apr 2019  
(12 week course)

A. Goswami  
Prof. Adrijit Goswami  
Dean, Continuing Education & NPTEL Coordinator  
IIT Kharagpur



Indian Institute of Technology Kharagpur





Roll No: NPTEL19EE01S41430150

To  
HOOGHLY ENGINEERING & TECHNOLOGY COLLEGE  
HOOGHLY

1/2125



Score	Type of Certificate
>=90	Elite+Gold
75-89	Elite+Silver
>=60	Elite
40-59	Successfully completed the course
<40	No Certificate

No. of credits recommended by NPTEL:3



# NPTEL Online Certification

(Funded by the Ministry of HRD, Govt. of India)



This certificate is awarded to

**INDRANI KOLEY**

for successfully completing the course

## Electrical Machines - II

with a consolidated score of **42** %

Online Assignments	10.50/25	Proctored Exam	31.25/75
--------------------	----------	----------------	----------

Total number of candidates certified in this course: **443**

Jan-Apr 2019  
(12 week course)

*A. Goswami*  
**Prof. Adrijit Goswami**  
Dean, Continuing Education & NPTEL Coordinator  
IIT Kharagpur



Indian Institute of Technology Kharagpur





Roll No: NPTEL19CS12S41430100

To  
HOOGHLY ENGINEERING & TECHNOLOGY COLLEGE  
HOOGHLY

1/2125



Score	Type of Certificate
>=90	Elite+Gold
75-89	Elite+Silver
>=60	Elite
40-59	Successfully completed the course
<40	No Certificate

No. of credits recommended by NPTEL:2



# NPTEL Online Certification

(Funded by the Ministry of HRD, Govt. of India)



This certificate is awarded to  
**ABINASH MANDI**  
for successfully completing the course

## Data Base Management System

with a consolidated score of **59** %

Online Assignments	15.88/25	Proctored Exam	43.5/75
--------------------	----------	----------------	---------

Total number of candidates certified in this course: **4749**

Feb-Apr 2019  
(8 week course)

**A. Goswami**  
Prof. Adrijit Goswami  
Dean, Continuing Education & NPTEL Coordinator  
IIT Kharagpur



Indian Institute of Technology Kharagpur







Roll No: NPTEL19CS07S51430150

To  
HOOGHLY ENGINEERING & TECHNOLOGY COLLEGE  
HOOGHLY

Score	Type of Certificate
>=90	Elite+Gold
75-89	Elite+Silver
>=60	Elite
40-59	Successfully completed the course
<40	No Certificate

1/2125



No. of credits recommended by NPTEL:3



**Elite**

# NPTEL Online Certification

(Funded by the Ministry of HRD, Govt. of India)



This certificate is awarded to

**PRITAM REJ**

for successfully completing the course

## Programming in Java

with a consolidated score of **71** %

Online Assignments	18.78/25	Proctored Exam	52.5/75
--------------------	----------	----------------	---------

Total number of candidates certified in this course: **8377**

Jan-Apr 2019  
(12 week course)

**A. Goswami**  
Prof. Adrijit Goswami  
Dean, Continuing Education & NPTEL Coordinator  
IIT Kharagpur



Indian Institute of Technology Kharagpur





Roll No: NPTEL19CE01S31560034

To  
HOOGHLY ENGINEERING & TECHNOLOGY COLLEGE  
HOOGHLY

1/2125



Score	Type of Certificate
>=90	Elite+Gold
75-89	Elite+Silver
>=60	Elite
40-59	Successfully completed the course
<40	No Certificate

No. of credits recommended by NPTEL:3



# NPTEL Online Certification

(Funded by the Ministry of HRD, Govt. of India)



This certificate is awarded to  
**SOURAV BISWAS**  
for successfully completing the course

## Soil Mechanics / Geotechnical Engineering I

with a consolidated score of **48** %

Online Assignments	22.81/25	Proctored Exam	25.5/75
--------------------	----------	----------------	---------

Total number of candidates certified in this course: 988

Jan-Apr 2019  
(12 week course)

*A. Goswami*  
Prof. Adrijit Goswami  
Dean, Continuing Education & NPTEL Coordinator  
IIT Kharagpur



Indian Institute of Technology Kharagpur





Roll No:NPTEL18ME51S21360316

To

HOOGHLY ENGINEERING & TECHNOLOGY COLLEGE  
HOOGHLY

7/2125



Score	Type of Certificate
>=90	Elite + Gold Medal
60-89	Elite
40-59	Successfully Completed the course
<40	No Certificate

No. of credits recommended by NPTEL:3



# NPTEL Online Certification

(Funded by the Ministry of HRD, Govt. of India)



This certificate is awarded to

**KAUSTAV MAITY.**

for successfully completing the course

## Fundamentals of Manufacturing Processes

with a consolidated score of **54 %**

Online Assignments	9.38/25	Proctored Exam	45/75
--------------------	---------	----------------	-------

Prof. B. K. Gandhi

Coordinator, Continuing Education Center  
NPTEL Coordinator, IIT Roorkee

Total number of candidates certified in this course: **1084**

Jul-Oct 2018

(12 week course)



Indian Institute of Technology Roorkee





Roll No:NPTEL18EE47S21360091

To

HOOGHLY ENGINEERING & TECHNOLOGY COLLEGE  
HOOGHLY

2/2125



Score	Type of Certificate
>=90	Elite + Gold Medal
60-89	Elite
40-59	Successfully Completed the course
<40	No Certificate

No. of credits recommended by NPTEL:2



# NPTEL Online Certification

(Funded by the Ministry of HRD, Govt. of India)



This certificate is awarded to

**SUMONA KARMAKAR**

for successfully completing the course

**Microwave Integrated Circuits**

with a consolidated score of **52 %**

Online Assignments	17.50/25	Proctored Exam	34.5/75
--------------------	----------	----------------	---------

Total number of candidates certified in this course: **46**

Prof. Sridhar Iyer  
Head CDEEP & NPTEL Coordinator  
IIT Bombay

Aug-Oct 2018  
(8 week course)



Indian Institute of Technology Bombay





Roll No:NPTEL18EE25S21521867

To

HOOGHLY ENGINEERING & TECHNOLOGY COLLEGE  
HOOGHLY

3/2125



Score	Type of Certificate
>=90	Elite + Gold Medal
60-89	Elite
40-59	Successfully Completed the course
<40	No Certificate

No. of credits recommended by NPTEL:2



# NPTEL Online Certification

(Funded by the Ministry of HRD, Govt. of India)



This certificate is awarded to

**SAHIL SARKAR**

for successfully completing the course

**Advanced Linear Continuous Control Systems:  
Applications with MATLAB Programming and Simulink**  
with a consolidated score of **55 %**

Online Assignments	14.04/25	Proctored Exam	40.5/75
--------------------	----------	----------------	---------

Prof. B. K. Gandhi  
Coordinator, Continuing Education Center  
NPTEL Coordinator, IIT Roorkee

Total number of candidates certified in this course: **247**

**Aug-Oct 2018**  
**(8 week course)**



Indian Institute of Technology Roorkee





Roll No:NPTEL18EE20S21360327

To

HOOGHLY ENGINEERING & TECHNOLOGY COLLEGE  
HOOGHLY

177/2125



Score	Type of Certificate
>=90	Elite + Gold Medal
60-89	Elite
40-59	Successfully Completed the course
<40	No Certificate

No. of credits recommended by NPTEL:3



Elite

# NPTEL Online Certification

(Funded by the Ministry of HRD, Govt. of India)



This certificate is awarded to

**ANKIT BHARDWAJ**

for successfully completing the course

**Control Engineering**

with a consolidated score of **61 %**

Online Assignments	17.81/25	Proctored Exam	42.75/75
--------------------	----------	----------------	----------

Total number of candidates certified in this course: **490**

Prof. A. Ramesh  
Chairman  
Center for Continuing Education, IITM

Jul-Oct 2018  
(12 week course)

Prof. Andrew Thangaraj  
NPTEL Coordinator  
IIT Madras



Indian Institute of Technology Madras





Roll No:NPTEL18EE14S21360373

To

HOOGHLY ENGINEERING & TECHNOLOGY COLLEGE  
HOOGHLY

5/2125



Score	Type of Certificate
>=90	Elite + Gold Medal
60-89	Elite
40-59	Successfully Completed the course
<40	No Certificate

No. of credits recommended by NPTEL:3



# NPTEL Online Certification

(Funded by the Ministry of HRD, Govt. of India)



This certificate is awarded to

**PRITAM CHAKRABORTY**

for successfully completing the course

**Fundamentals of Electrical Engineering**

with a consolidated score of **46 %**

Online Assignments	17.88/25	Proctored Exam	28.5/75
--------------------	----------	----------------	---------

Prof. Anupam Basu  
NPTEL Coordinator  
IIT Kharagpur

Total number of candidates certified in this course: **1173**

Jul-Oct 2018  
(12 week course)

Prof. Adrijit Goswami  
Dean  
Continuing Education, IIT Kharagpur



Indian Institute of Technology Kharagpur





Roll No:NPTEL18CS53S11532914

To

HOOGHLY ENGINEERING & TECHNOLOGY COLLEGE  
HOOGHLY

191/2125



Score	Type of Certificate
>=90	Elite + Gold Medal
60-89	Elite
40-59	Successfully Completed the course
<40	No Certificate

No. of credits recommended by NPTEL:3



Elite

# NPTEL Online Certification

(Funded by the Ministry of HRD, Govt. of India)



This certificate is awarded to

**SAIKAT DEY**

for successfully completing the course

**Discrete Mathematics**

with a consolidated score of **77 %**

Online Assignments	24.09/25	Proctored Exam	52.5/75
--------------------	----------	----------------	---------

Total number of candidates certified in this course: **982**

Prof. A. Ramesh  
Chairman  
Center for Continuing Education, IITM

Jul-Oct 2018  
(12 week course)

Prof. Andrew Thangaraj  
NPTEL Coordinator  
IIT Madras



Indian Institute of Technology Madras







Roll No:NPTEL18CS45S11480194

To

HOOGHLY ENGINEERING & TECHNOLOGY COLLEGE  
HOOGHLY

170/2125



Score	Type of Certificate
>=90	Elite + Gold Medal
60-89	Elite
40-59	Successfully Completed the course
<40	No Certificate

No. of credits recommended by NPTEL:2



Elite

# NPTEL Online Certification

(Funded by the Ministry of HRD, Govt. of India)



This certificate is awarded to

**RAMANUJ BHATTACHARJEE**

for successfully completing the course

**Cloud Computing and Distributed Systems**

with a consolidated score of **75 %**

Online Assignments	23.67/25	Proctored Exam	51/75
--------------------	----------	----------------	-------

Total number of candidates certified in this course: **529**

*T V Prabhakar*

Prof. T. V. Prabhakar  
Chairman  
Center for Continuing Education, IITK

Aug-Oct 2018  
(8 week course)

*Satyaki Roy*

Prof. Satyaki Roy  
NPTEL Coordinator  
IIT Kanpur



Indian Institute of Technology Kanpur





Roll No:NPTEL18CS40S11370319

To

HOOGHLY ENGINEERING & TECHNOLOGY COLLEGE  
HOOGHLY

9/2125



Score	Type of Certificate
>=90	Elite + Gold Medal
60-89	Elite
40-59	Successfully Completed the course
<40	No Certificate

No. of credits recommended by NPTEL:2



Elite

# NPTEL Online Certification

(Funded by the Ministry of HRD, Govt. of India)



This certificate is awarded to

**KINGSHUK PAL**

for successfully completing the course

**Introduction to Machine Learning**

with a consolidated score of **80 %**

Online Assignments	19.54/25	Proctored Exam	60/75
--------------------	----------	----------------	-------

Prof. Anupam Basu  
NPTEL Coordinator  
IIT Kharagpur

Total number of candidates certified in this course: **3147**

Aug-Oct 2018  
(8 week course)

Prof. Adrijit Goswami  
Dean  
Continuing Education, IIT Kharagpur



Indian Institute of Technology Kharagpur





Roll No:NPTEL18CS33S21360366

To

HOOGHLY ENGINEERING & TECHNOLOGY COLLEGE  
HOOGHLY

186/2125



Score	Type of Certificate
>=90	Elite + Gold Medal
60-89	Elite
40-59	Successfully Completed the course
<40	No Certificate

No. of credits recommended by NPTEL:2



Elite

# NPTEL Online Certification

(Funded by the Ministry of HRD, Govt. of India)



This certificate is awarded to

**SREEJA DE**

for successfully completing the course

**Introduction to Programming in C**

with a consolidated score of **64 %**

Online Assignments	23.75/25	Proctored Exam	40.5/75
--------------------	----------	----------------	---------

Total number of candidates certified in this course: **3925**

*T V Prabhakar*

Prof. T. V. Prabhakar  
Chairman  
Center for Continuing Education, IITK

Aug-Oct 2018  
(8 week course)

*Satyaki Roy*

Prof. Satyaki Roy  
NPTEL Coordinator  
IIT Kanpur



Indian Institute of Technology Kanpur





Roll No:NPTEL18CE20S11531085

To

HOOGHLY ENGINEERING & TECHNOLOGY COLLEGE  
HOOGHLY

192/2125



Score	Type of Certificate
>=90	Elite + Gold Medal
60-89	Elite
40-59	Successfully Completed the course
<40	No Certificate

No. of credits recommended by NPTEL:3



# NPTEL Online Certification

(Funded by the Ministry of HRD, Govt. of India)



This certificate is awarded to

**PRAWESH KUMAR JHA**

for successfully completing the course

**Concrete Technology**

with a consolidated score of **51 %**

Online Assignments	16.19/25	Proctored Exam	35.11/75
--------------------	----------	----------------	----------

Total number of candidates certified in this course: **636**

Prof. A. Ramesh  
Chairman  
Center for Continuing Education, IITM

Jul-Oct 2018  
(12 week course)

Prof. Andrew Thangaraj  
NPTEL Coordinator  
IIT Madras



Indian Institute of Technology Madras





Roll No:NPTEL18CE19S11370088

To

HOOGHLY ENGINEERING & TECHNOLOGY COLLEGE  
HOOGHLY

6/2125



Score	Type of Certificate
>=90	Elite + Gold Medal
60-89	Elite
40-59	Successfully Completed the course
<40	No Certificate

No. of credits recommended by NPTEL:2



Elite

# NPTEL Online Certification

(Funded by the Ministry of HRD, Govt. of India)



This certificate is awarded to

**RITWIK GUIN**

for successfully completing the course

## Matrix Method of Structural Analysis

with a consolidated score of **74 %**

Online Assignments	19.50/25	Proctored Exam	54/75
--------------------	----------	----------------	-------

Prof. Anupam Basu  
NPTEL Coordinator  
IIT Kharagpur

Total number of candidates certified in this course: **194**

Aug-Oct 2018  
(8 week course)

Prof. Adrijit Goswami  
Dean  
Continuing Education, IIT Kharagpur



Indian Institute of Technology Kharagpur



# Hooghly Engineering & Technology College



## Google Classroom



**CMOS VLSI DESIGN**  
ECE 3RD YEAR




**New material: question bank**

17 May

0 class comments



**swagata mallik**

17 Apr

**Meet link for tomorrow's class. Join sharp at 9:45 am**

1 attachment

0 class comments




**New assignment: Continuous Evaluation (CA2)**

22 Feb

0 class comments

**This class has been archived. [Restore](#)**

  
**Stream**

  
**Classwork**

  
**People**

*SAs*  
DIC, ECE Deptt.  
HETC, Hooghly.

*Shree*



# CMOS VLSI DESIGN (PE-EC603... ECE (2019-23)



**New assignment: Continuous Evaluation (CA3)**

27 Apr 2022

0 class comments



**New assignment: CONTINUOUS EVALUATION (CA2)**

1 Apr 2022 (Edited 1 Apr 2022)

0 class comments



**swagata mallik**

30 Mar 2022

An assignment for CA2 will be posted here on 1st April. All are requested to submit the google form by 1st positively.

Syllabus: inverter ( resistive load, nmos load and cmos)

0 class comments

This class has been archived.

**Restore**

Stream

Classwork

People



*SWS*  
DIC, ECE Deptt.  
HETG, Hooghly.

*Shanig*





**New assignment: Continuous Evaluation (CA4)**

19 Jul 2021

0 class comments



**New material: IC fabrication**

17 Jul 2021 (Edited 18 Jul 2021)

0 class comments



**swagata mallik**

16 Jul 2021

**CA4 exam will be held on 19th of july from 3 pm.**

**Full marks 10**

**Time duration : 30 mins**

**Syllabus: IC fabrication**

...

0 class comments

New assignment: CA3: CMOS VLSI

**This class has been archived.**

**Restore**

Stream

Classwork

People

*SMS*  
DIC, ECE Deptt.  
HETC, Hooghly

*Shan*



# Electronic Devices (Theory)



**New material: But notes**

22 Jan

0 class comments



**New material: IC fabrication**

22 Jan (Edited 22 Jan)

0 class comments



**New material: Module 4 notes**

22 Jan (Edited 22 Jan)

0 class comments



**New material: Numerical \_ junction diode**

10 Jan

This class has been archived.

[Restore](#)

Stream

Classwork

People

*Loss*  
DIC, ECE Deptt.  
HETC, Hooghly,

*Shaw*

Customize

# Transportation Engineering

CE

Meet

Generate link

Class code

kct3yoq

Upcoming

No work due soon

View all



Announce something to your class



Tanumoy Ghosh  
Nov 19, 2022

Traffic Engineering



Rotary.pdf  
PDF



npTEL CE TEI L40.pptx  
PowerPoint



npTEL CE TEI L41.pptx  
PowerPoint



npTEL CE TEI L42.pptx  
PowerPoint

A. Chattopadhyay



The screenshot shows the Google Classroom interface for a class titled "Surveying and Geomatics Laboratory(CE(PC)493)". The left sidebar contains navigation options: Home, Calendar, Teaching, To review, and Archived classes. The main content area has tabs for Stream, Classwork, People, and Grades. A message at the top of the stream says "Class is archived. Restore it to add or edit anything." Below this is a banner for the class with the title "Surveying and Geomatics Laboratory(CE(PC)493)". Two posts are visible in the stream, both by Arpita Das: "Arpita Das posted a new material: Salient Points for Practice of Traversing/ Contour/Longit..." dated May 17, and "Arpita Das posted a new material: SW-DTM Software" dated May 17.

The screenshot shows the Google Classroom interface for a class titled "Computer Applications in Civil Engineering (CE(PC)5... 3rd year)". The left sidebar is identical to the first screenshot. The main content area has tabs for Stream, Classwork, People, and Grades. A banner for the class is visible with the title "Computer Applications in Civil Engineering (CE(PC)5... 3rd year" and a "Customize" button. Below the banner, there is a "Meet" section with a "Generate link" button and a "Class code" section with the code "7vvlhnm". A post by Arpita Das is visible: "Arpita Das posted a new assignment: Analyse the residential building as attached herewith." dated Oct 12.

Arpita Das . 02/11/21



Classroom > Structural Analysis-II  
CE 3rd Year, 6th Sem, 2023

Stream Classwork People Grades

Class is archived. Restore it to add or edit anything. Restore

### Structural Analysis-II

CE 3rd Year, 6th Sem, 2023

- Subhadeep Biswas posted a new material: Solution for cantilever method  
Jul 9
- Subhadeep Biswas posted a new material: Portal method  
May 21

https://classroom.google.com/u/1/c/NTo1MTQ0AgwODM2

Classroom > Civil Engineering – Societal and Global Impact (CE...  
CE(HS)401

Stream Classwork People Grades

Class is archived. Restore it to add or edit anything. Restore

### Civil Engineering – Societal and Global ...

CE(HS)401

- Subhadeep Biswas posted a new material: Environmental Engineering  
Jun 11
- Subhadeep Biswas posted a new material: Solid and Hazardous Waste Management  
May 29

1 class comment.

*Angita Das*

*02/11/21*



# Hooghly Engineering & Technology College



## Router with GPS Location

Seminar Hall





GPS Map Camera

Chinsurah, West Bengal, India

Hooghly Engineering & Technology College, Vivekananda  
Road, Pipulpati, Hooghly, WB - 712103

Lat 22.900031°

Long 88.392707°

14/06/23 10:51 AM GMT +05:30

Google




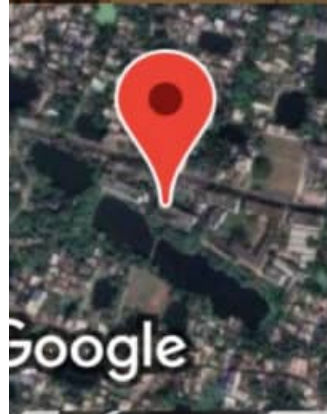


Hooghly Engineering & Technology College



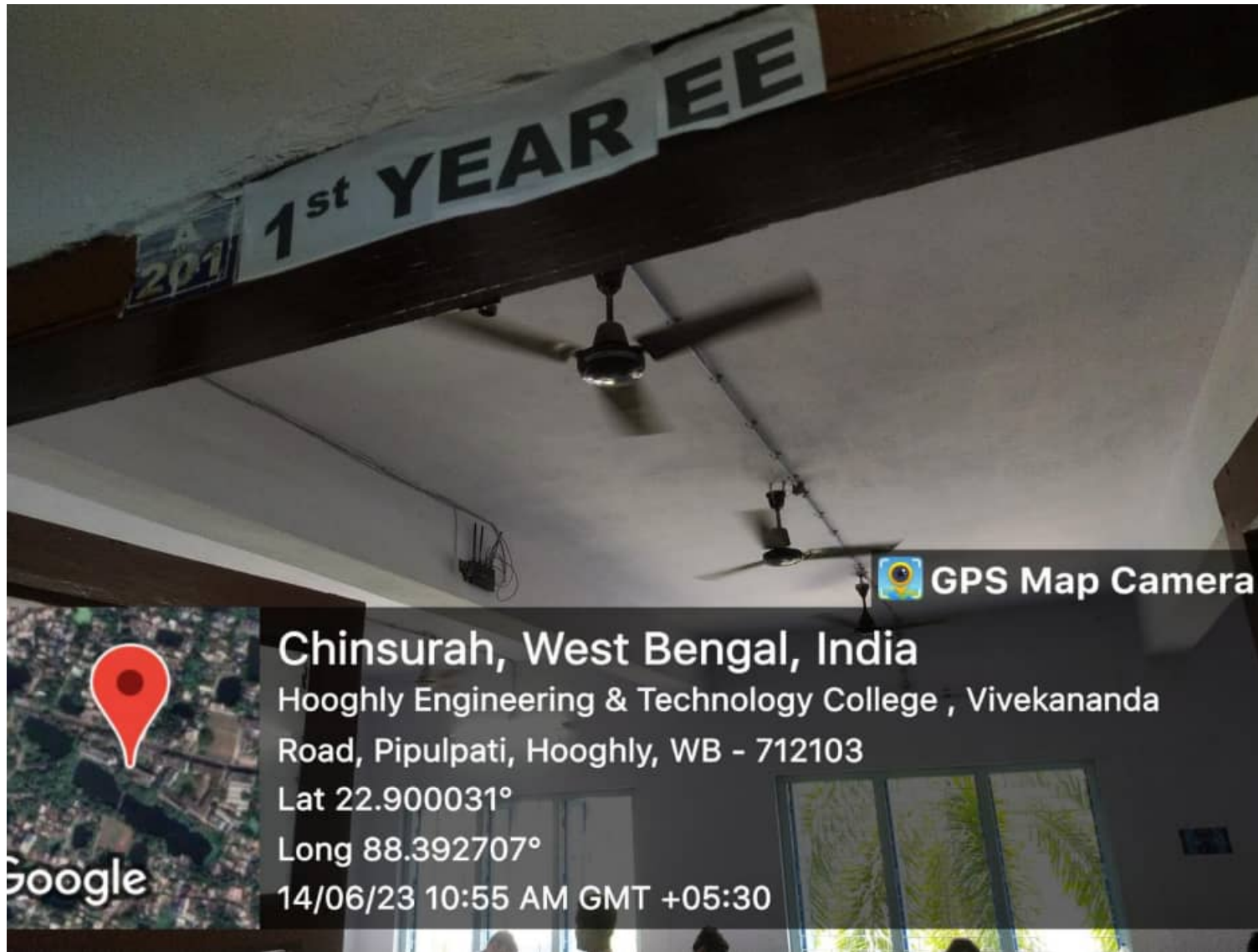
Heartiest  
CONGRATULATIONS to  
Saket Ghosh, EE Dept.  
2003 passout batch  
student of Hooghly  
Engineering &  
Technology College for  
being placed at  
Pinnacle Infotech  
SOLUTIONS.

 **GPS Map Camera**



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Hooghly Engineering & Technology College , Vivekananda  
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Lat 22.900031°  
Long 88.392707°  
14/06/23 10:50 AM GMT +05:30

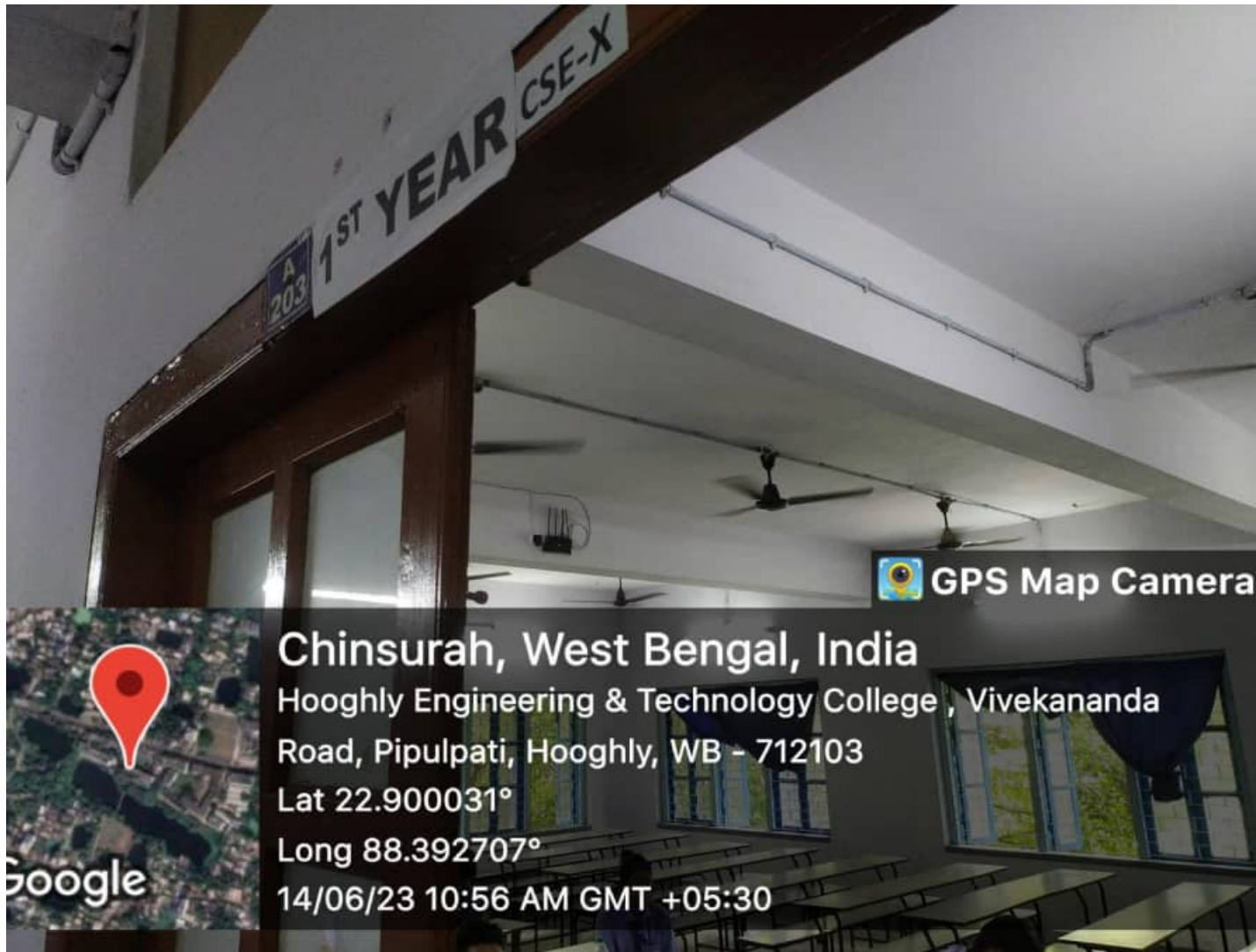
Class Room (A201)



Class Room (A202)




Class Room (A203)



Class Room (A204)



 GPS Map Camera

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Road, Pipulpati, Hooghly, WB - 712103

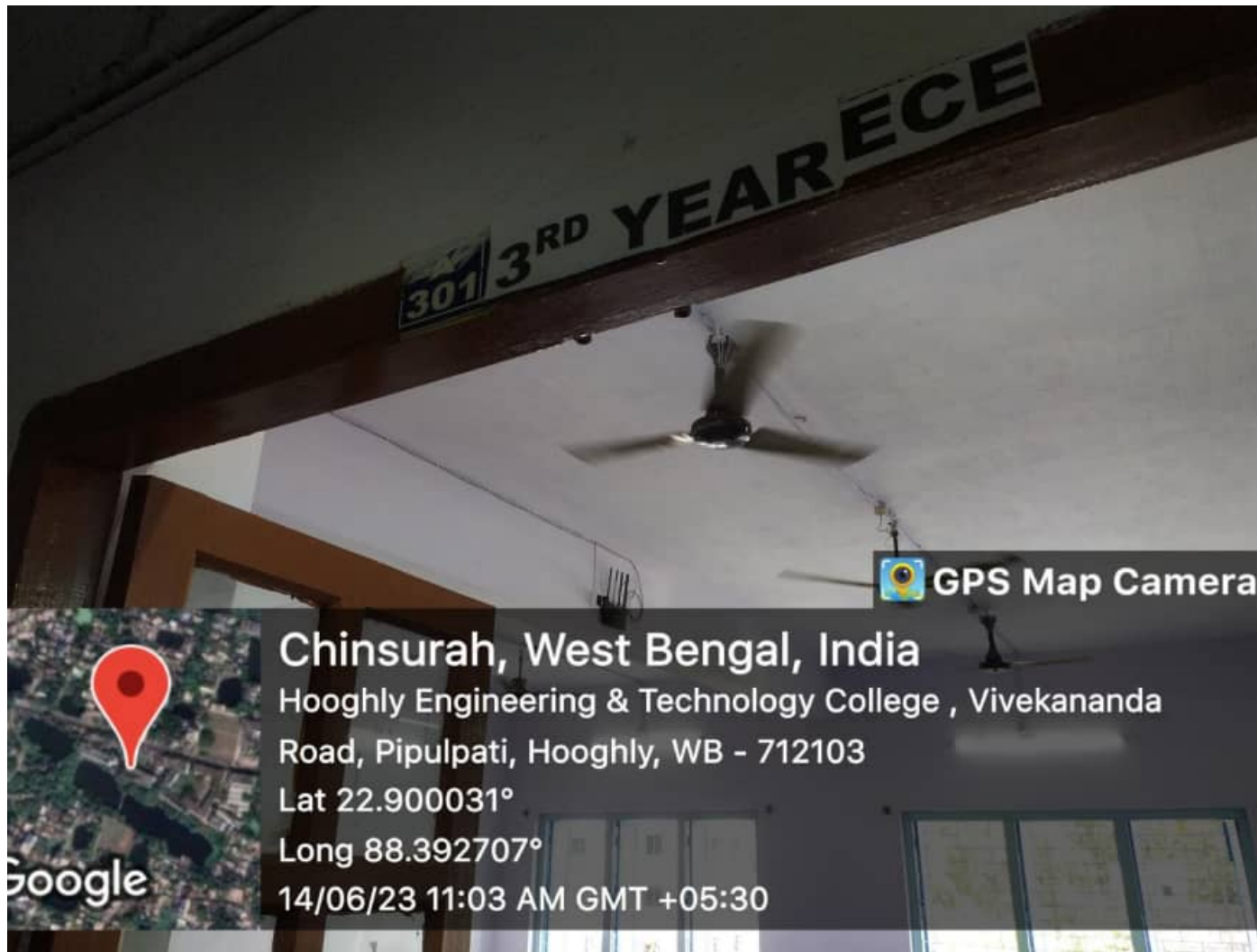
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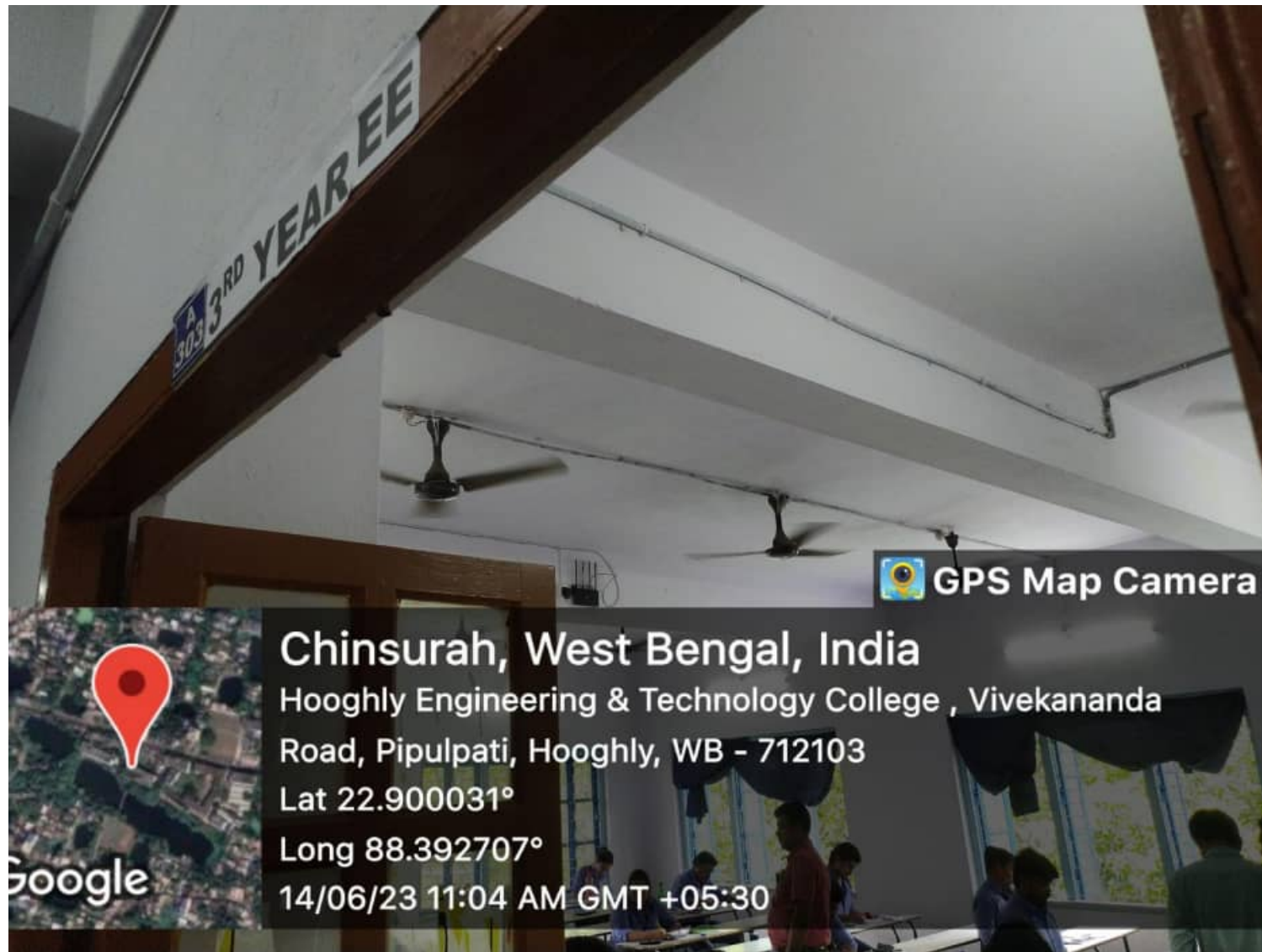
Class Room (A301)



Class Room (A302)

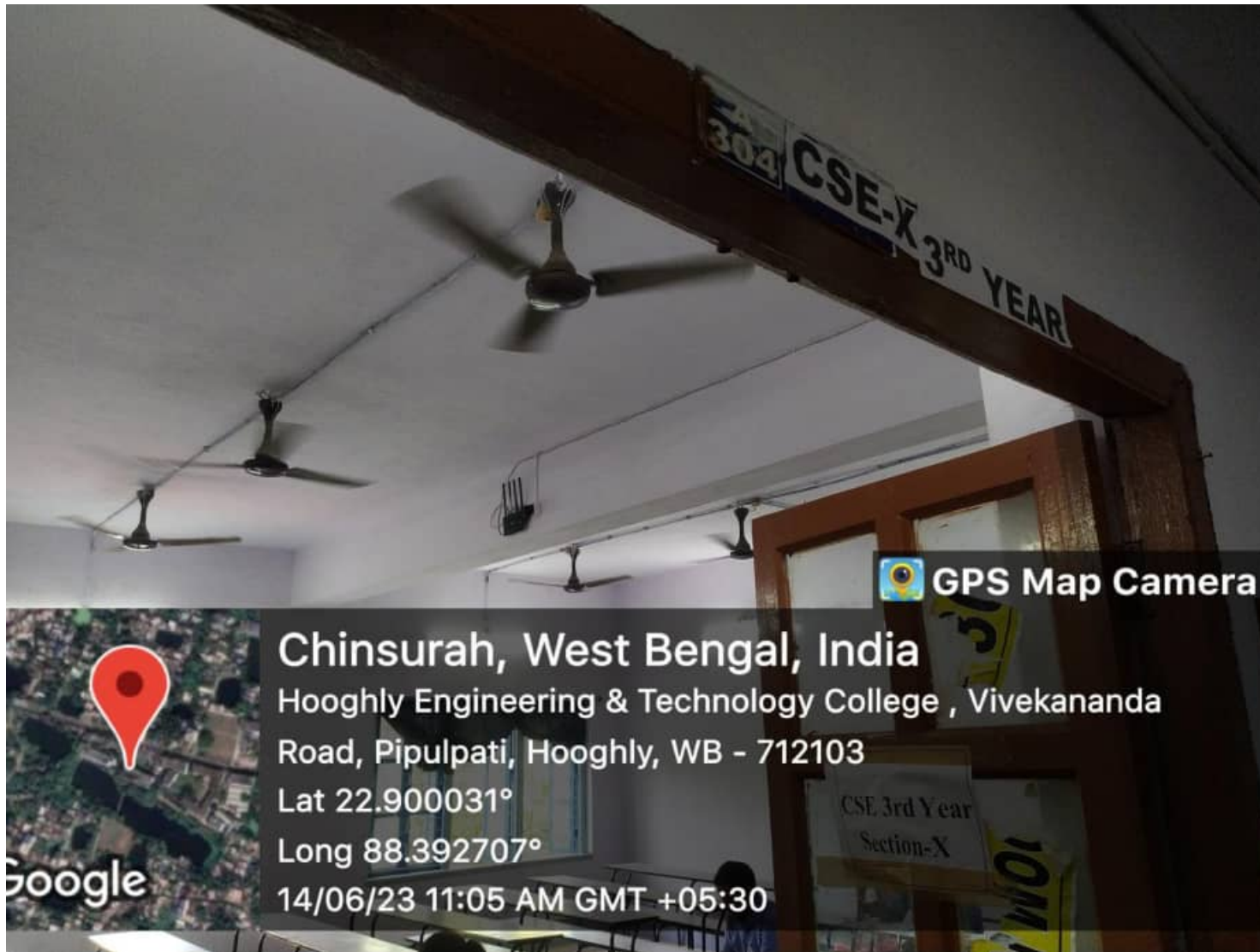



Class Room (A303)





Class Room (A304)



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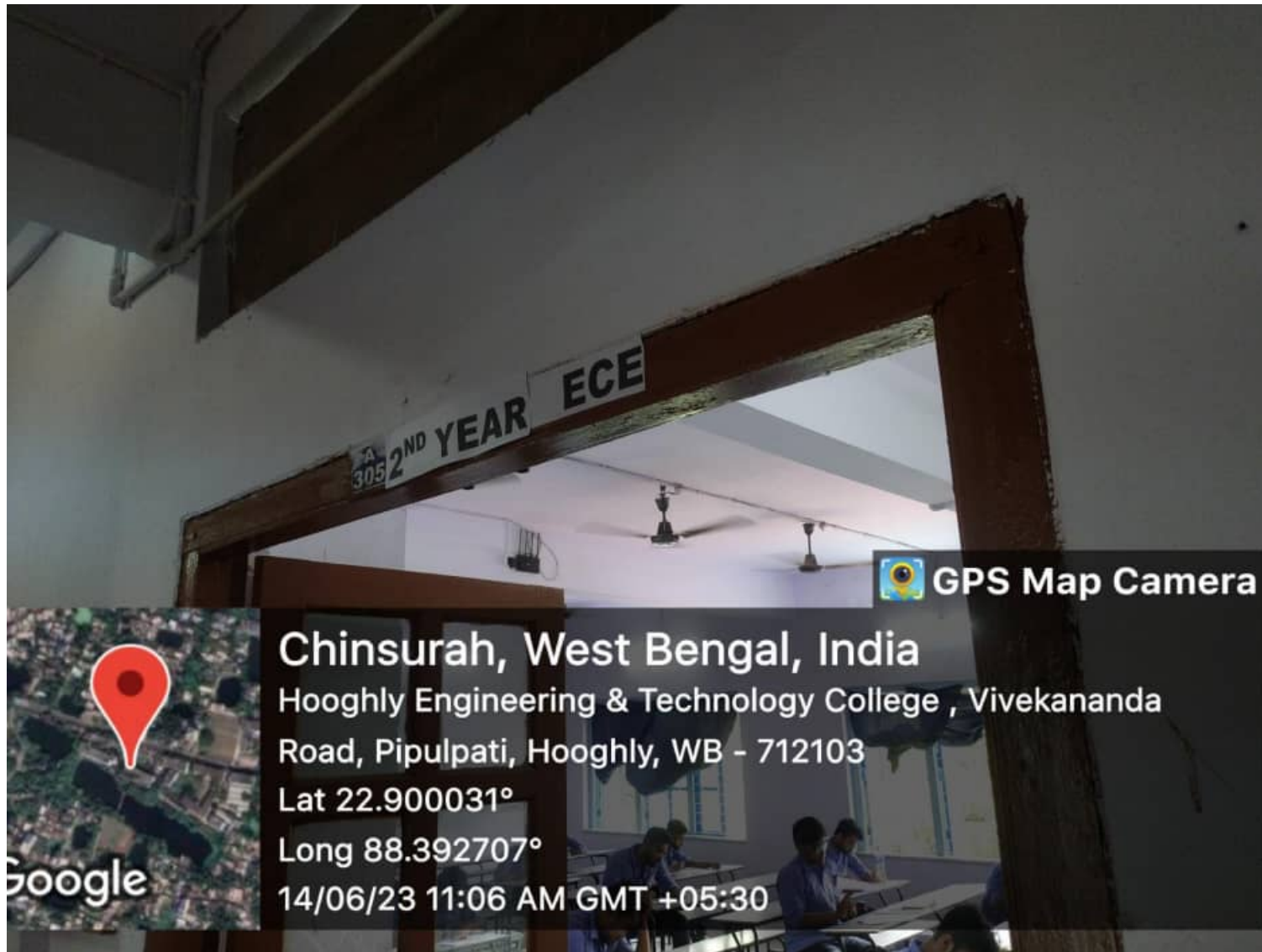
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Long 88.392707°

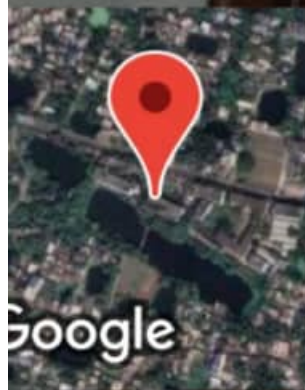
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Google

Class Room (A305)



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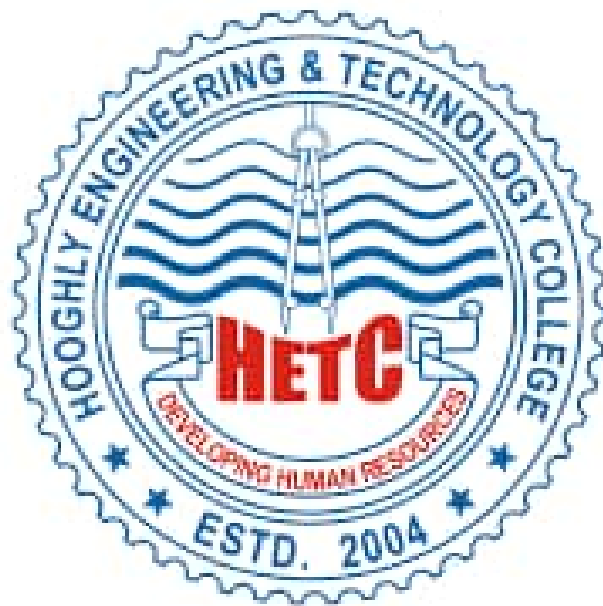
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Long 88.392707°

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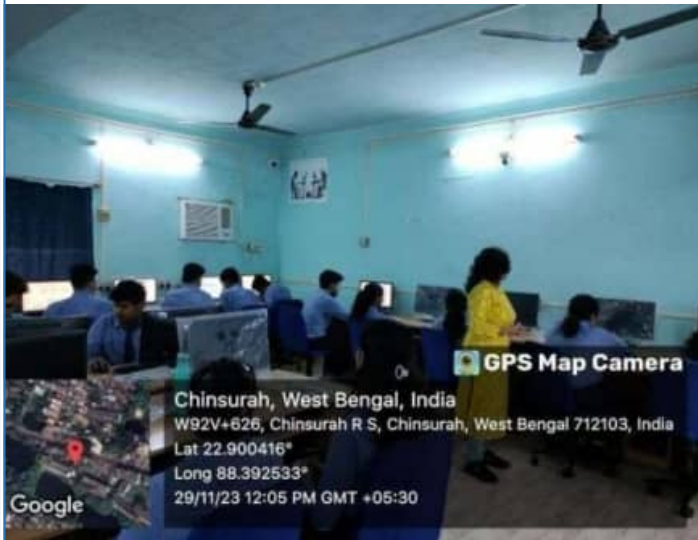
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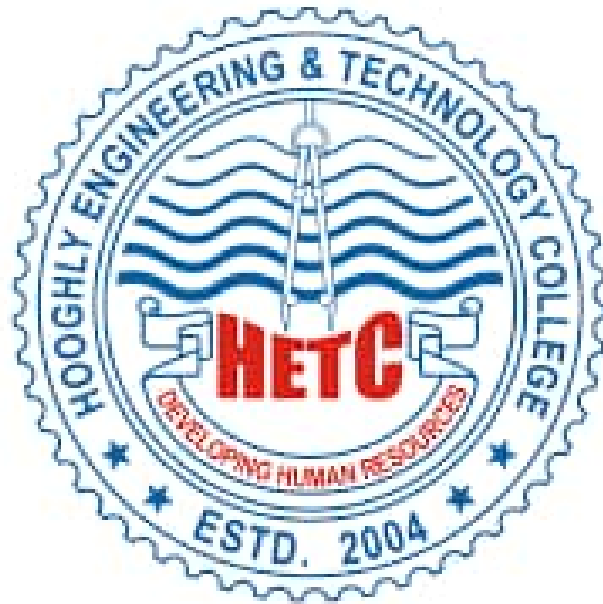


## Computer Laboratory

# COMPUTER SCIENCE AND ENGINEERING LABORATORY



# Hooghly Engineering & Technology College



## Journal Subscription

(2018-2023)



Always  
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# DRDO NEWSLETTER



A Monthly Bulletin of Defence Research and Development Organisation

AUGUST 2018

VOLUME 38

ISSUE 8



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## DIPR HANDS OVER PROTOTYPE OF TRAINING MANAGEMENT SYSTEM TO ARTRAC

TD PROGRAMME >>> p05  
EVENTS >>> p06  
SOCIAL ACTIVITIES >>> p17

FOCUS >>> p1

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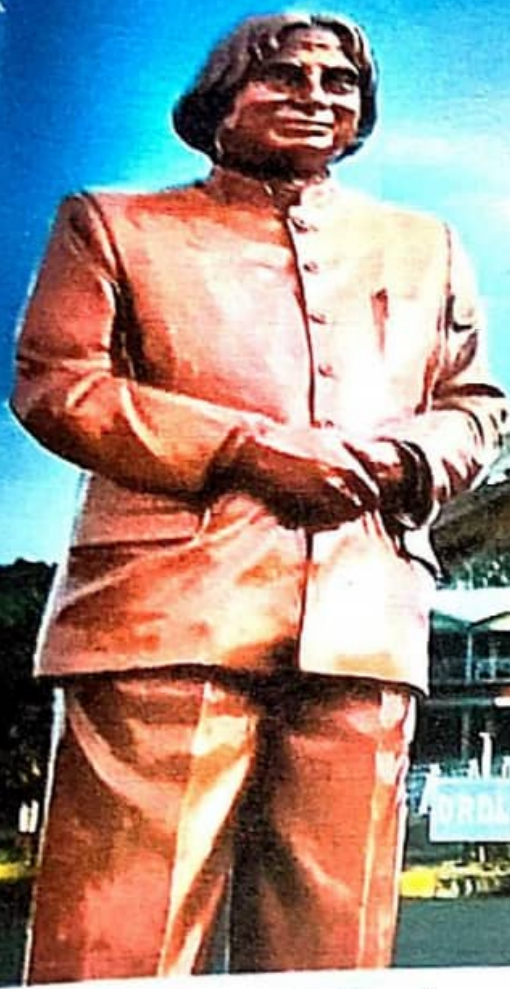


# TECHNOLOGY FOCUS

तकनीक पर ध्यान

Vol. 26 No. 04, July-August 2018

A MONTHLY R&T MAGAZINE OF DRDO



## Material Development and Characterisation

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A Monthly Bulletin of Defence Research and Development Organisation

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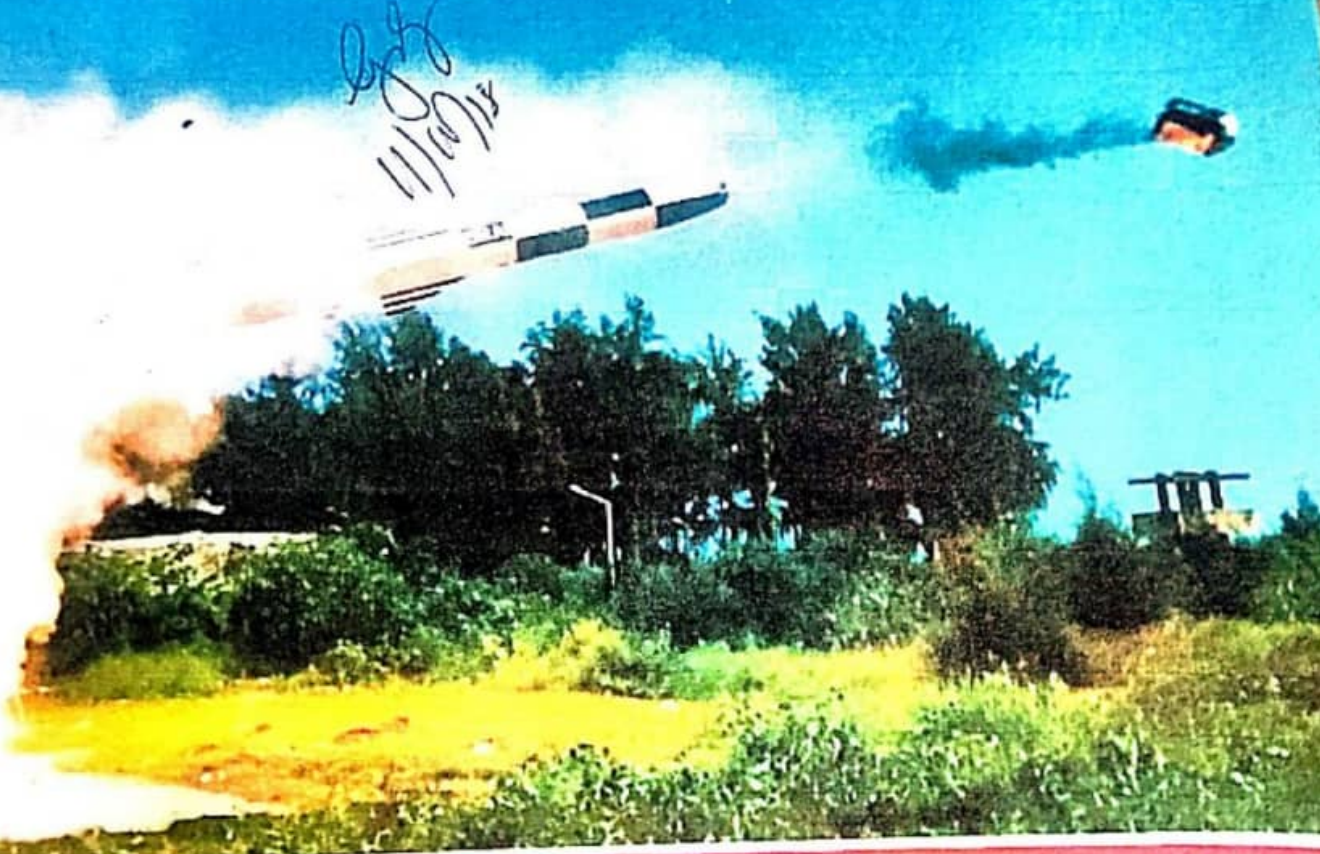
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INNOVATION >> p05

TOT >> p07

EVENTS >> p08

FOCUS >> p

VISITS >>

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ISSN : 2319-443X



*July  
2019*

VOLUME 7

NUMBER 2

JULY-DECEMBER 2019

GLOBAL JOURNAL OF

# Accounting and Economy Research



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VOLUME 7

NUMBER 1

JANUARY-JUNE 2019

*International Journal of*

# CIVIL ENGINEERING AND APPLICATIONS

I J C E A



*Received*  
11.10.2018  
11.10.2018

Volume 2, Issue 2 - 2019

Peer Reviewed Journal

# International Journal of Advanced Research in Civil & Structural Engineering



Advanced Research Publications  
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*Recd.*  
11.11.19  
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Volume 8, Number 1,  
January-June 2019

# Indian Journal of Computational Sciences and Technology

Editor-in-Chief: Khalid Saeed, D.Sci., Ph.D.



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January 2019

Vol. XII No. 1

# The IUP Journal of ELECTRICAL & ELECTRONICS ENGINEERING



**IUP Publications**  
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# Journal of Advanced Research in Cloud Computing, Virtualization and Web Applications

Peer Reviewed Journal



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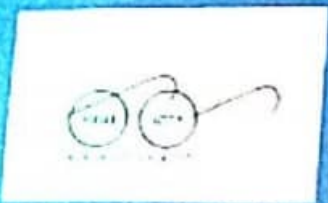
ISSN Application No. 21806

# Journal of Materials Science

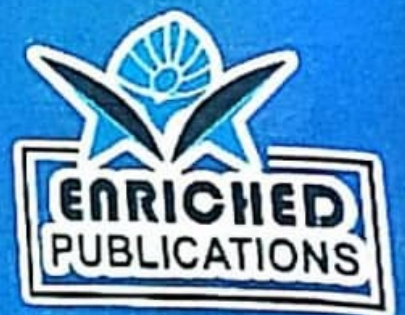
September - December 2019

Vol - 7, Issue -3

## JMSC



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# Journal of Wireless Communication, Networks and Mobile Engineering Technology

Volume- 4, No.- 3, (Sept.- Dec. 2019)



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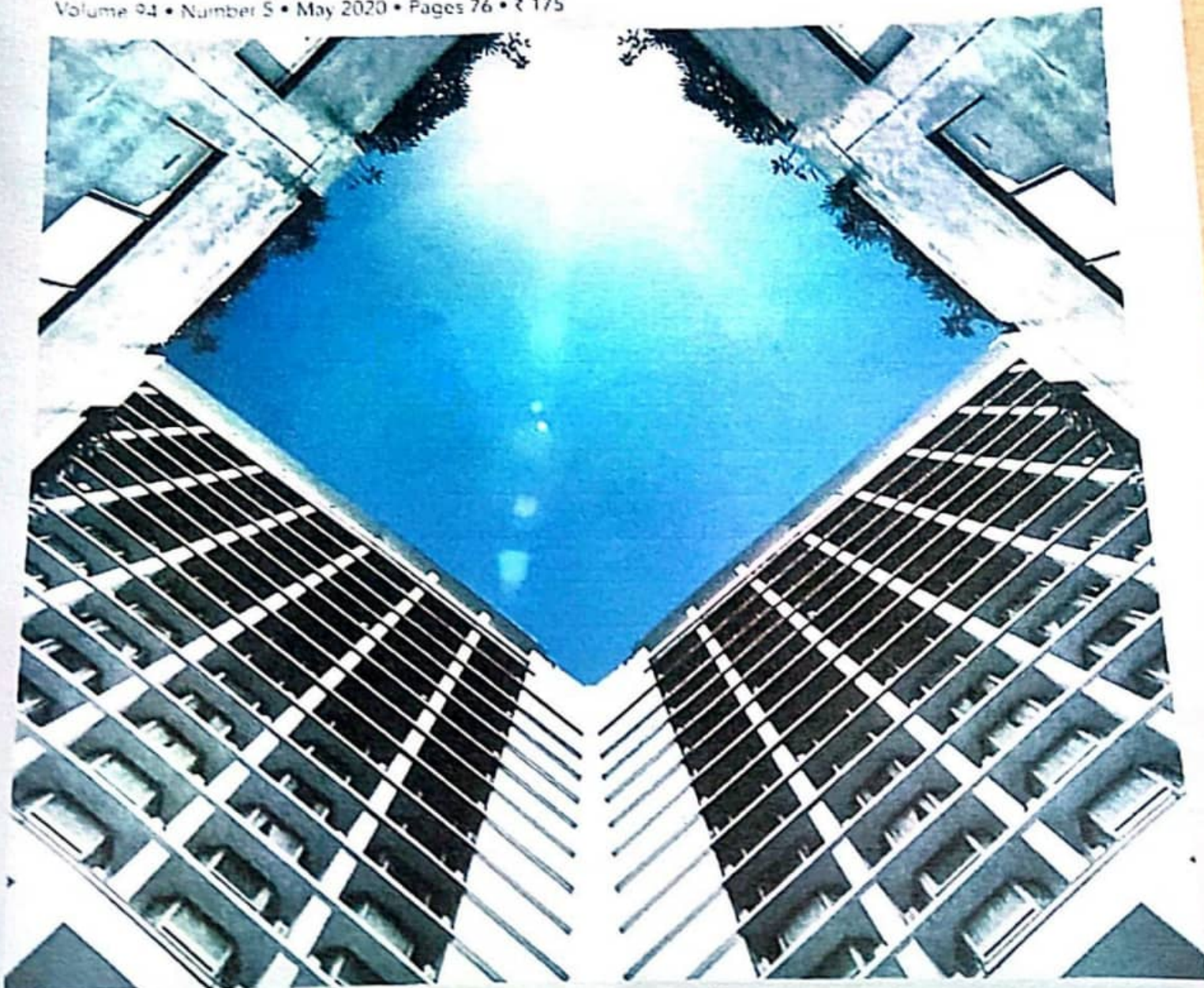
**MANTECH**  
Publication

# ICJ

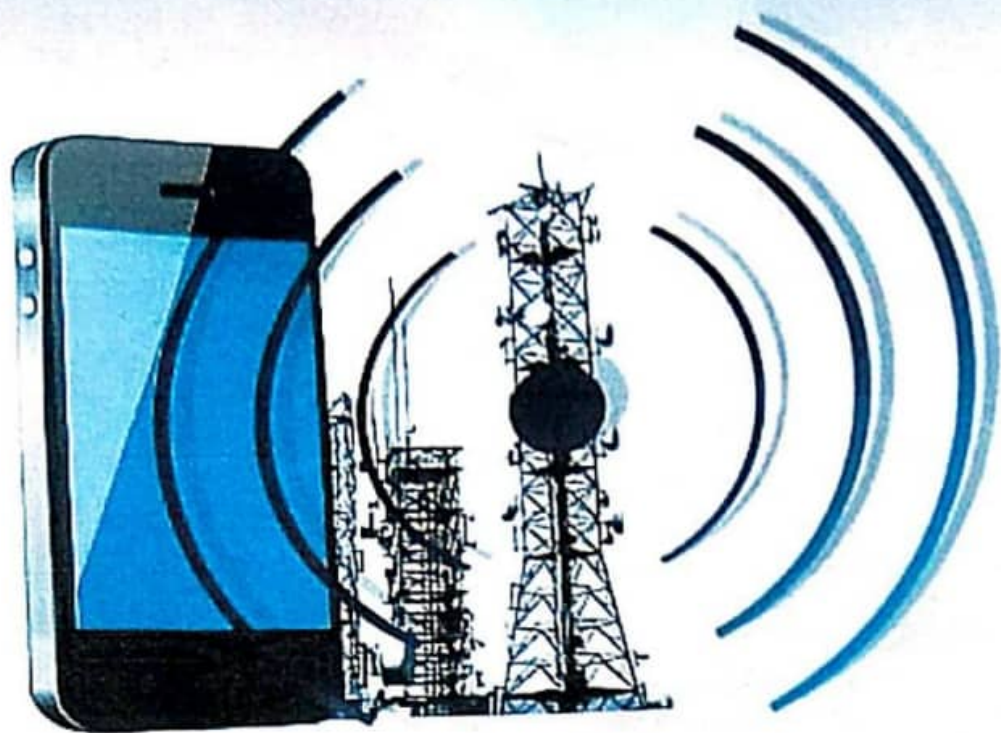
THE INDIAN CONCRETE JOURNAL

Published by ACC Limited

Volume 94 • Number 5 • May 2020 • Pages 76 • ₹ 175



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Inventi Impact

# Wireless Communications & Networking

ISSN: 2349-3518  
Volume 2020, Issue 4 | October-December 2020

172  
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# IEEE TRANSACTIONS ON CIRCUITS AND SYSTEMS II: EXPRESS BRIEFS

A PUBLICATION OF THE IEEE CIRCUITS AND SYSTEMS SOCIETY



WWW.IEEE-CAS.ORG

FEBRUARY 2021

VOLUME 68

NUMBER 2

ITCSFK

(ISSN 1549-7747)

## SPECIAL SECTION: INVITED TUTORIALS

### SPECIAL SECTION PAPERS

Oscillator Flicker Phase Noise: A Tutorial .....	Y. Hu, T. Siriburanon, and R. B. Staszewski	538
Recent Advances and Trends in Noise Shaping SAR ADCs .....	G. M. Salgado, D. O'Hare, and I. O'Connell	545
Doubly-Tuned Transformer Networks: A Tutorial .....	A. Bevilacqua and A. Mazzanti	550
Circuit Techniques for High Efficiency Fully-Integrated Switched-Capacitor Converters .....	J. Jiang, X. Liu, W.-H. Ki, P. K. T. Mok, and Y. Lu	556
Tutorial: Design of High-Speed Nano-Scale CMOS Mixed-Voltage Digital I/O Buffer With High Reliability to PVT Variations .....	C.-C. Wang	562
Recent Advances on Linear Low-Dropout Regulators .....	J. Silva-Martinez, X. Liu, and D. Zhou	568
Multimodal Neural Interface Circuits for Diverse Interaction With Neuronal Cell Population in Human Brain .....	T. Lee and M. Je	574
Mixed-Signal Neuromorphic Computing Circuits Using Hybrid CMOS-RRAM Integration .....	V. Saxena	581

## SPECIAL SECTION: 2021 IEEE LATIN AMERICAN SYMPOSIUM ON CIRCUITS AND SYSTEMS (LASCAS)

### SPECIAL SECTION PAPERS

A 120 mV Supply, Triode-Regulated Femto-Watt CMOS Voltage Reference Design .....	F. Olivera, L. Souza da Silva, and A. Petraglio	587
A Redundancy-Based Background Calibration for Comparator Offset/Threshold and DAC Gain in a Ping-Pong SAR ADC .....	K. Bunsen, E. Martens, Q. Dermit, and J. Craninckx	592
An Energy-Efficient Haar Wavelet Transform Architecture for Respiratory Signal Processing .....	M. M. da Rosa, H. B. Seidel, G. Paim, E. A. da Costa, S. Almeida, and S. Bampi	597
28nm FDSOI Ultra Low Power 1.5-2.0 GHz Factorial-DLL Frequency Synthesizer .....	A. Asprilla, D. Cordova, Y. Deval, H. E. Lapuyade, and F. Rivet	60

(Contents Continued on Page 53)

IEEE  
Circuits and Systems Society  
1549-7747



# IEEE TRANSACTIONS ON CIRCUITS AND SYSTEMS

## II: EXPRESS BRIEFS

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JULY 2022

VOLUME 60

NUMBER 7

ITCSFK

(ISSN 1549-7747)

### SPECIAL ISSUE ON TUTORIAL BRIEFS 2022

#### SPECIAL ISSUE PAPERS

Invited Tutorial: Analog Matrix Computing With Crosspoint Resistive Memory Arrays .....	Z. Sun and D. Ielmini	3024
Multirate Timestamp Modeling for Ultralow-Jitter Frequency Synthesis: A Tutorial .....	Y. Hu, T. Srihuranon, and R. B. Staszewski	3030
Injection-Locking Techniques for CMOS Millimeter-Wave and Terahertz Signal Generation .....	X. Liu and H. C. Luong	3037
A Mini Tutorial of Processing in Memory: From Principles, Devices to Prototypes .....	B. Pan, G. Wang, H. Zhang, W. Kang, and W. Zhao	3044
Toward Efficient Computing for Robots: From a Circuit and System View .....	H. Xu, Y. Yang, F. Min, J. Huang, X. Chen, Y. Han, and N. Sun	3051
Piezoelectric Energy Harvesters: An Overview on Design Strategies and Topologies .....	J. Wang, Z. Chen, Z. Li, J. Jiang, J. Liang, and X. Zeng	3057
Algorithm/Accelerator Co-Design and Co-Search for Edge AI .....	X. Zhang, Y. Li, J. Pan, and D. Chen	3064
Advances in Wearable Brain-Computer Interfaces From an Algorithm-Hardware Co-Design Perspective .....	W. Byun, M. Je, and J.-H. Kim	3071

(Contents Continued on Page 3023)

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# Hooghly Engineering & Technology College



Makaut Exam Question

(2018-2022)



**MAULANA ABUL KALAM AZAD UNIVERSITY OF  
TECHNOLOGY, WEST BENGAL**

**Paper Code : ES-EE-101**

**BASIC ELECTRICAL ENGINEERING**

**Time Allotted: 3 Hours**

**Full Marks: 70**

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words  
as far as practicable.*

*The questions are of equal value.*

**Group – A**

**(Multiple Choice Type Questions)**

1. Choose the correct alternative for *any ten* of the following questions: 1×10=10
- (i) If there are two bulbs connected in series and one blows out the following may happen:
- (a) The other bulb continues to glow with the same brightness
  - (b) The other bulb stops glowing
  - (c) The other bulb glows with increased brightness
  - (d) The other bulb also burns out
- (ii) If the applied voltage across a lamp is reduced by 50%, then the power consumption will reduce to
- |         |         |
|---------|---------|
| (a) 50% | (b) 75% |
| (c) 25% | (d) 40% |
- (iii) The form factor of a current waveform is 1. The shape of the waveform is
- |                |                |
|----------------|----------------|
| (a) sinusoidal | (b) triangular |
| (c) square     | (d) saw tooth  |

- (iv) The DC motor needs a starter during starting to control
- (a) speed
  - (b) voltage
  - (c) current
  - (d) flux

- (v) DC voltage of 100V is applied to a circuit consisting of a resistance of  $10\Omega$  and inductance of 5 Henry connected in series. The time constant of the circuit is
- (a) 2S
  - (b) 1S
  - (c) 0.5S
  - (d) 0.25S

- (vi) The superposition theorem satisfies the principle of
- (a) Reciprocity
  - (b) Duality
  - (c) Linearity
  - (d) Non-linearity

- (vii) The ratio of output voltage to input voltage of a boost converter operating at a duty cycle 'D' is given by
- (a) D
  - (b)  $1 - D$
  - (c)  $\frac{1}{1-D}$
  - (d)  $\frac{1}{D}$

- (viii) Two alternating currents are represented by  $i_1 = \sin(\omega t - 30^\circ)$  and  $i_2 = \sin(\omega t + 30^\circ)$ .
- (a)  $i_1$  leads  $i_2$  by  $60^\circ$
  - (b)  $i_1$  lags  $i_2$  by  $60^\circ$
  - (c)  $i_2$  leads  $i_1$  by  $30^\circ$
  - (d)  $i_2$  lags  $i_1$  by  $30^\circ$

- (ix) The positive plates of nickel iron cell is made up of
- (a) Nickel hydroxide
  - (b) Lead peroxide
  - (c) Ferrous hydroxide
  - (d) Potassium hydroxide

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(x) The maximum efficiency of the transformer occurs at when

- (a) Iron loss = Copper loss  
(b) Eddy current loss = Copper loss  
(c) Hysteresis loss = Copper loss  
(d) Iron loss > Copper loss

(xi) The frequency of emf induced in the rotor of a 3 phase, 50 Hz induction motor at standstill is

- (a) 0 Hz  
(b) 50 Hz  
(c) 25 Hz  
(d) 100 Hz

(xii) The field of a synchronous generator is excited by

- (a) AC supply  
(b) DC supply  
(c) Either by AC or DC supply  
(d) Composite AC and DC supply

**Group – B**

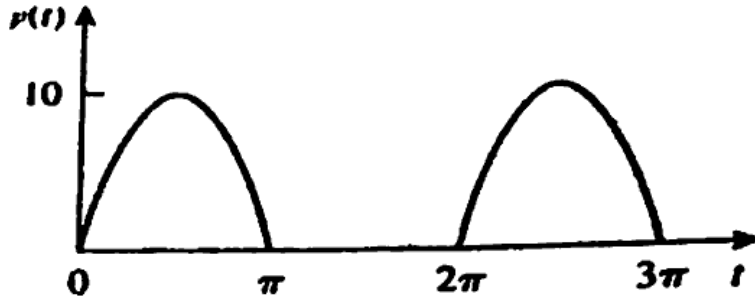
**(Short Answer Type Questions)**

**Answer any three of the following.**

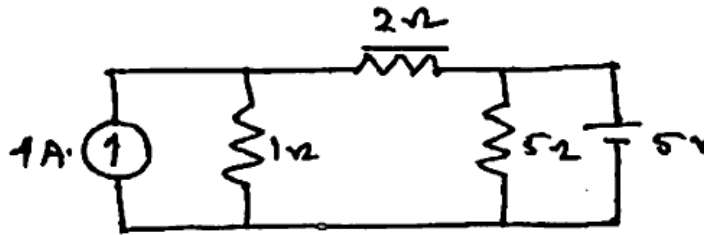
**5×3=15**

2. Explain the principle of working of a single phase induction motor.
3. A coil having a resistance of  $5 \Omega$  and inductance of  $0.1 \text{ H}$  is connected in series with a  $50 \mu\text{F}$  capacitor. A sinusoidal voltage of  $200\text{V}$  is applied to the circuit. At what frequency the current in the circuit will be maximum? Calculate this current & voltage across the capacitor at this frequency.
4. A series circuit consisting of a non-inductive resistor of  $R\Omega$  & a pure inductance of  $L \text{ Henry}$  connected across a DC voltage source of  $V$  volts through a switch  $S$ . Derive the equation of the current in the circuit at any instant ' $t$ ' after closing the switch.

5. Find the average and rms voltage of the voltage waveform shown. What is the power dissipation across a  $9 \Omega$  resistor. Supplied with voltage.



6. Using superposition theorem find the current through the resistor  $5 \Omega$  in the Circuit shown.  
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Group - C

(Long Answer Type Questions)

Answer any three of the following.

15×3=45

7. (a) A 15 KVA, 1100/110V, 50 Hz single phase transformer has the following test results:  
Open circuit test LV side: 110 V, 0.8 A, 90 W  
Short circuit test HV side: 70 V, 12 A, 100 W  
Determine the following  
(i) core loss of the transformer.

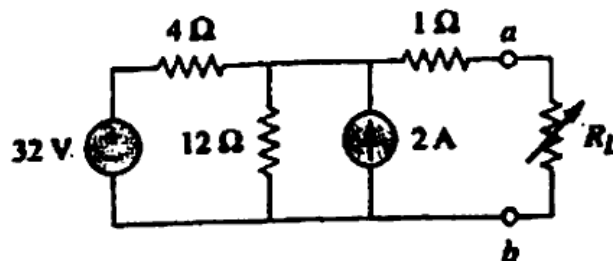
$\frac{1}{4}$

$=$

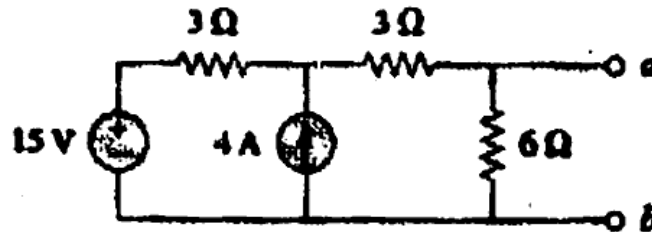
- (ii) equivalent resistance & leakage reactance referred to the HV side.
  - (iii) equivalent resistance and the leakage reactance referred to the LV side.
  - (iv) regulation of transformer at full load and half load of 0.8 pf lagging.
  - (v) efficiency of the transformer at full load and half load at 0.8 pf lagging.
- (b) Draw the connection and phasor diagram at the following two types of three phase transformers.  
Yy6 & Yd1 10+5=15

8. (a) Explain the meaning of phase and phase difference of sinusoidal quantities.
- (b) A coil of resistance of  $30\Omega$  and inductance  $320\text{ mH}$  is connected in parallel to a circuit consisting of a  $75\Omega$  resistor in series with  $150\mu\text{F}$  capacitor. The circuit is connected to a  $200\text{ V}$ ,  $50\text{ Hz}$  supply. Determine the supply current and circuit power factor.
- (c) At  $t = 0$ , the instantaneous value of  $50\text{ Hz}$  sinusoidal current is  $5\text{ A}$  and increase in magnitude further. Its rms value is  $10\text{ A}$ .
- (i) Write the expression of its instantaneous value.
  - (ii) Find the current at  $F = 0.01\text{ s}$  and  $t = 0.015\text{ s}$
  - (iii) Sketch the waveforms indicating these values.
- 2+8+5=15

9. (a) Find the Thevenin equivalent of the circuit across a – b, shown in the figure below:



(b) Determine the Norton equivalent of the circuit shown below:



(c) A balanced mesh connected load of  $(6 + j8)\Omega$  is connected across a 3 phase, 50 Hz, 230 V supply system. Calculate: 5+5+5=15

- (i) line current
- (ii) power factor
- (iii) active power

10. (a) A 3 phase 50 Hz induction motor has a full load speed of 1440 rpm. Calculate:

- (i) Slip
- (ii) No. of poles
- (iii) frequency of induced emf of rotor
- (iv) speed of rotor field with respect to rotor structure
- (v) speed of rotor field with respect to stator field

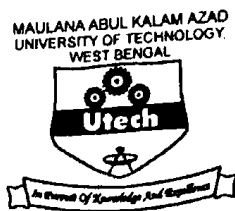
(b) Explain with relevant diagram the method of speed control of a separately excited DC motor. 8+7=15

11. Write notes on *any three* of the following:

3×5=15

- (a) Three phase voltage source inverter
  - (b) Method of power factor improvement
  - (c) Buck converter
  - (d) Auto transformer
- 

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**MAULANA ABUL KALAM AZAD UNIVERSITY OF  
TECHNOLOGY, WEST BENGAL**

**Paper Code : BS-CH-101**

**CHEMISTRY-1**

Time Allotted: 3 Hours

Full Marks: 70

*The figures in the margin indicate full marks.  
Candidates are required to give their answers in their own words  
as far as practicable.*

**Group - A**

**(Multiple Choice Type Questions)**

1. Choose the correct alternatives for *any ten* of the following:

1×10=10

(i) Which of the following is the expression of Schrödinger wave equation?

(a)  $\nabla^2\Psi + (h^2/8\pi^2m)(E - V)\Psi = 0$

(b)  $\nabla^2\Psi + (8\pi^2m/h^2)(E - V)\Psi = 0$

(c)  $(-\hbar^2/2m\nabla^2 + E)\Psi - V\Psi = 0$

(d)  $(-2m/\hbar^2\nabla^2 + V)\Psi - E\Psi = 0$

(ii) All living body is the example of

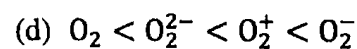
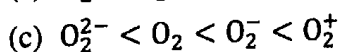
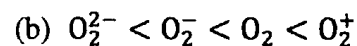
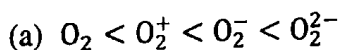
(a) open system

(b) closed system

(c) isolated system

(d) exothermic system

(iii) The correct order of bond dissociation energy is



(iv) What is the hybridization of  $XeF_4$ ?

(a)  $Sp^2$

(b)  $Sp^3$

(c)  $Sp^3d$

(d)  $Sp^3d^2$

(v) (2R, 4S)-2, 4-dichloropentane and (2S, 4R)-2, 4-dichloropentane are

(a) enantiomers

(b) diastereomers

(c) identical

(d) constitutional isomers

- (vi) In electrochemical corrosion
- (a) oxidation occurs at the anode
  - (b) reduction occurs at the anode
  - (c) both oxidation-reduction occurs at the anode
  - (d) it is not an example of oxidation-reduction reaction
- (vii) Which of these exhibit fluorescence?
- (a) NaCl
  - (b) BaF<sub>2</sub>
  - (c) CaF<sub>2</sub>
  - (d) CaCl<sub>2</sub>
- (viii) Unit of frequency is
- (a) cm
  - (b) sec
  - (c) hertz
  - (d) gm
- (ix) Which of the following is not part of a polarimeter?
- (a) NICOL
  - (b) Diffraction grating
  - (c) Simple tube
  - (d) Analyser
- (x) The nucleus which will not show any peak in the NMR spectrum is
- (a) <sup>1</sup>H
  - (b) <sup>17</sup>O
  - (c) <sup>16</sup>O
  - (d) <sup>2</sup>H
- (xi) Which of the following is true for the Galvanic cell?
- (a) The cell potential is always negative.
  - (b) The product are less stable than the reactants.
  - (c) ΔG for the cell reaction is positive.
  - (d) Chemical energy is converted to Electrical energy.
- (xii) van der Waals type of bond is formed by
- (a) sharing of electron.
  - (b) transfer of electron from one atom to other atom.
  - (c) sharing of electron by one atom only.
  - (d) weak electrostatic force of interaction among fluctuating dipoles.
- (xiii) Silicon doped with gallium forms
- (a) p-type semiconductor
  - (b) n-type semiconductor
  - (c) insulator
  - (d) None of these

**Group – B**

**(Short Answer Type Questions)**

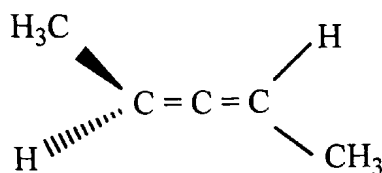
**Answer any three of the following.**

5×3=15

2. (a) Explain the term chemical potential.
- (b) Derive the relation of EMF of cell with ΔG and ΔH.

1+4=5

3. (a) Draw the molecular energy level diagram for  $O_2$ .  
 (b) Explain the paramagnetic behaviour of  $O_2$  under the light of MO theory as an evidence of failure of VBT. 3+2=5
4. Prove that,  $(V - \frac{\hbar^2}{8\pi^2m} \nabla^2) \Psi = E\Psi$ . 5
5. (a) Show that, entropy of mixing of ideal gases  $\Delta S_{mix} > 0$ .  
 (b) What is the physical significance of free energy change ( $\Delta G$ )? 3+2=5
6. (a) Define specific rotation for an optically active molecule.  
 (b) What is the necessary and sufficient condition for a molecule to be optically active?  
 (c) The following compound does not have a chiral center still it shows optical activity— comment.



1+2+2=5

### Group - C

(Long Answer Type Questions)

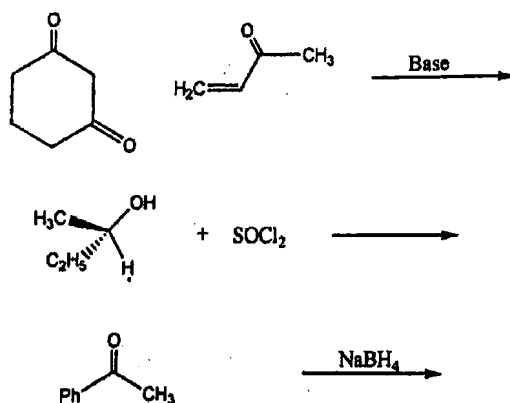
Answer *any three* of the following.

15×3=45

7. (a) State Hund's rule of spin multiplicity and Pauli Exclusion principle. Write down the electronic configuration of Fe ( $Z = 26$ ).  
 (b) Calculate the effective nuclear charge of 4s electrons of Fe ( $Z = 26$ ) with the help of Slater's rule.  
 (c) Define Pauling's Scale of electronegativity.  
 (d) Electron affinity of Cl is greater than F explain the phenomenon.  
 (e) Between  $BeCl_2$  and  $BaCl_2$  which one has more melting point and why?  
 (f) Show the hybridization and calculate the CFSE of  $[Fe^{2+}(H_2O)_6]^{2+}$  and  $[Fe^{3+}(H_2O)_6]^{3+}$  complex ions. (1+1+1)+2+2+2+2+2+4=15
8. (a) Draw all possible stereoisomers for butane-2, 3-diol. Are all of them optically active? Give reason.  
 (b) Draw the Fischer projection formula of following stereoisomers:  
 (i) (2R, 3R) -2, 3-dibromobutanedioic acid  
 (ii) S-2-Hydroxy-2-phenylpropanoic acid  
 (c) How enantiomers differ from diastereomers?  
 (d)  $S_N1$  mechanism proceeds through partial racemization of the product. Explain.  
 (e) Halogens are ortho-para orienting and deactivating. Give reason. 4+(1+1)+3+3+3=15



9. (a) Define the following elements of symmetry with a suitable example in each case:  
 (i) Rotational axis of symmetry  
 (ii) Plane of symmetry  
 (iii) Centre of symmetry  
 (iv) Alternating axis of symmetry
- (b) What is Beer-Lambert law? Show that absorption is linearly proportional to concentration of the solution. (4×2)+(2+3)+2=15
- (c) Explain-trans-Stilbene absorbs at a longer wavelength than cis-Stilbene. (4×2)+(2+3)+2=15
10. (a) Define corrosion. What are different types of corrosion?  
 (b) What do you mean by hardness of water? Explain how hard water fails to form lather with soap? What are different types of hardness?  
 (c) Explain the potentiometric titration with suitable diagram of precipitation reactions between NaCl and AgNO<sub>3</sub>. (1+4)+(1+2+2)+5=15
11. (a) State the postulates of Crystal Field Theory.  
 (b) Calculate the de Broglie wavelength associated with a stone having velocity 1 m s<sup>-1</sup> and mass 100g; on the other side an electron having velocity 6×10<sup>5</sup> m s<sup>-1</sup> and mass 9.1×10<sup>-31</sup> kg. Which one of these is meaningful and why?  
 (c) Predict the product of the following reaction with a plausible mechanism.



- (d) How do you measure the pH of unknown solution using calomel electrode?  
 (e) What type of storage cell is used in your mobile cell? 3+3+(2+2+1)+3+1=15
12. Write the short notes on *any five* of the following: 5×3=15
- Fluorescence and its application
  - Hard soft acids and bases
  - Gibbs-Helmholtz equation
  - Fajan's rule
  - n* and *p*-type semiconductor
  - Features of Ellingham diagram



**MAULANA ABUL KALAM AZAD UNIVERSITY OF  
TECHNOLOGY, WEST BENGAL**

Paper Code : PH-301

PUID : 03003 ( To be mentioned in the main answer script )

**PHYSICS-II**

Time Allotted : 3 Hours

Full Marks : 70

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words as far as practicable.*

**GROUP - A**

**( Multiple Choice Type Questions )**

1. Choose the correct alternatives for any ten of the following : 10 × 1 = 10

i) A butterfly is flying inside a hollow sphere. What is the type of constrain ?

- a) Holonomic
- b) Non-holonomic
- c) Scleronomic
- d) Rheonomic.

ii) A cube of side  $a$  is placed in a uniform electric field  $\vec{E} = \hat{i} E_0$ . the total electric flux through the cube

is

- a)  $2a^2 E_0$
- b)  $6a^2 E_0$
- c)  $4a^2 E_0$
- d) 0.

iii) The relation between  $\vec{D}$  (Displacement vector),  $\vec{E}$  (Electric field) and  $\vec{P}$  (Polarization vector) is

- a)  $\vec{D} = \epsilon_0 \vec{E} - \vec{P}$
- b)  $\vec{D} = \epsilon_0 \vec{E} + \vec{P}$
- c)  $\vec{D} = \epsilon_0 \vec{P} + \vec{E}$
- d)  $\vec{D} = \vec{E} + \vec{P}/\epsilon_0$ .

iv) The differential form of Ampere's circuital law is

- a)  $\vec{\nabla} \cdot \vec{B} = \mu_0 \vec{J}$
- b)  $\vec{\nabla} \times \vec{B} = \mu_0 \vec{J}$
- c)  $\vec{\nabla} \cdot \vec{B} = \vec{J}$
- d)  $\vec{\nabla} \times \vec{B} = \mu_0 \epsilon_0 \vec{J}$ .

v) The direction of propagation of electromagnetic wave is given by

- a) along  $\vec{E} \cdot \vec{B}$
- b) along  $\vec{E} \times \vec{B}$
- c) along  $\vec{B}$
- d) along  $\vec{E}$ .

vi) An electric dipole placed in a non-uniform electric field experiences

- a) a torque but not a force
- b) a force as well as a torque
- c) a force but not a torque
- d) neither a force nor a torque.

vii) The two parallel wires carry current along opposite directions. The resultant force experienced by the two wires is

- a) repulsive
- b) attractive
- c) torsional
- d) no force.

viii) For any scalar function  $\phi = xyz$ , Curl ( grad  $\phi$  ) at ( 1, 1, 1 ) is

- a)  $(\hat{i} + \hat{j} + \hat{k})$                       b)  $2(\hat{i} + \hat{j} + \hat{k})$   
c)  $\frac{1}{\sqrt{3}}(\hat{i} + \hat{j} + \hat{k})$                   d) 0.

ix) If a charged particle of mass  $m$  is accelerated through potential difference  $V$ , the de-Broglie wavelength is proportional to

- a)  $V$     b)  $V^{-\frac{1}{2}}$   
c)  $V^2$     d)  $V^{\frac{2}{3}}$ .

x) If a wave function  $\psi(x)$  is normalized, then

$$\iiint \psi^*(x) \psi(x) dv \text{ is}$$

- a) 0    b)  $\infty$   
c) 1    d) 1/2.

xi) A coin is tossed  $n$  times. The number of microstates is

- a)  $2^n$     b)  $2n!$   
c)  $n^2$     d)  $2^n / n!$

xii) The Fermi energy of a free electron gas depends on the electron density  $n$  as

- a)  $n^{\frac{1}{3}}$     b)  $n^{-\frac{1}{3}}$   
c)  $n^{\frac{2}{3}}$     d)  $n^{-\frac{2}{3}}$ .

xiii) For a projectile with position co-ordinate (  $x, y, z$  ), the number of cyclic co-ordinates is

- a) 1    b) 2  
c) 3    d) 4.

xiv) The value of  $[\hat{x}, \hat{p}^n]$  is

- a)  $\hat{i} n \hbar p_x^{n-1}$                               b)  $\hat{i} n \hbar x^{n-1}$   
c)  $\hat{i} \hbar p_x^{\frac{n-1}{n}}$                                   d) 0.

xv) The degrees of freedom of a system consisting of  $N$  particles subjected to  $l$  number of constraints is equal to

- a)  $(3N + l)$                                       b)  $(3Nl)$   
c)  $(3N)^l$     d)  $(3N - l)$ .

**GROUP - B**

**( Short Answer Type Questions )**

Answer any three of the following. 3 × 5 = 15

- a) If the function  $\phi(x, y, z) = 2xy + z^2$ , is its corresponding field sonenoidal or irrotational?  
b) Derive the Coulomb law from Gauss' law. 3 + 2
- A capacitor is made of two spherical sphere conductors of radii  $a$  and  $b$  ( where  $a < b$  ), with vacuum in the intervening space. If the external sphere is kept at ground and the outer one has a charge density  $\sigma$ , then solve the Laplace's equation to find the electrostatic potential in the space between the spheres.

4. a) Derive the expression of momentum operator. Show that 'position' operator and 'momentum' operator are not commutative.
- b) Write down the Lagrangian for a freely falling particle under gravity. (2 + 2) + 1
5. a) State Ampere's circuital law and deduce its differential form.
- b) Prove that  $\vec{E} = \sin(y-t)\hat{k}$  and  $\vec{B} = \sin(y-t)\hat{i}$  constitute a possible electromagnetic field. (1 + 2) + 2
6. a) Consider a three particle system each of which can exit in a energy state  $\epsilon_1$ ,  $\epsilon_2$  and  $\epsilon_3$ . What are the possible states, if the particles are (i) bosons, (ii) fermions?
- b) Draw and explain the Fermi distribution function at (i)  $T = 0$  K (ii)  $T > 0$  K. 3 + 2

**GROUP - C**

**( Long Answer Type Questions )**

Answer any *three* of the following.  $3 \times 15 = 45$

7. a) In a region of space, the electric field is given by  $\vec{E} = 3\hat{i} + 5\hat{k}$ . Calculate the electric flux through a surface area 100 square unit in X-Y plane.
- b) Explain electronic polarization of a dielectric material and find an expression for electronic polarizability in terms of radius of the atom.

- c) Show that the equation of continuity is given by  $\vec{\nabla} \cdot \vec{j} + \frac{\partial \rho}{\partial t} = 0$ , where the symbols have their usual meanings.
- d) What are the limitations of Newtonian mechanics?  $3 + (1 + 5) + 4 + 2$
8. a) Establish the relation  $\vec{D} = \epsilon_0 \vec{E} + \vec{P}$ , where the symbols have their usual meanings.
- b) If a charged particle of charge 0.5C is moving with a velocity  $3\hat{i} + 4\hat{j} + 5\hat{k}$  m/s through an electric  $\vec{E} = 5\hat{i} + 5\hat{k}$  and magnetic field induction  $\vec{B} = 2\hat{i} - 6\hat{j} - 6\hat{k}$ , then calculate the magnitude and direction of total Lorentz force.
- c) Find out Hamilton's equation of motion for a system comprising masses  $M_1$  and  $M_2$  connected by a massless string of length  $L$  through a frictionless pulley such that  $M_1 > M_2$ .
- d) What is skin depth?  $4 + 5 + 5 + 1$
9. a) Write down the Maxwell's field equations. hence, derive the electromagnetic wave equation in terms of electric vector ( in vacuum ).
- b) State the basic postulates of quantum mechanics.
- c) If the atomic weight and density of silver are 108 gm/mole and  $10.5 \text{ gm/cm}^3$  respectively, find the Fermi energy of silver at  $T = 0$  K (considering one free electron per atom).  $(2 + 3) + 5 + 5$

10. a) Write down Schrödinger equation for one dimensional motion of a free particle in an infinite deep potential well. Find its eigenfunction and eigenenergy.
- b) What is phase space? Derive the expression of density of state in energy range  $E$  to  $E + dE$  in phase space.
- c) The maximum electric field in an EM wave 800 V/m. Find the maximum value of magnetic intensity and the average value of Poynting vector.  $5 + (1 + 4) + 5$
11. a) Find the magnetic field of a circular loop carrying current  $I$  on a point on the axis of the loop.
- b) A short conductor of length 5 cm is placed parallel to a conductor of length 1.5 m. Both conductors carry a current of 3A and 2A respectively in the same direction. Find the nature and magnitude of the force experienced by the long conductor for their separation 3 cm.
- c) What are the advantages of generalized coordinate?
- d) Obtain the equation of motion of a simple pendulum using Lagrange equation.  $5 + 3 + 2 + 5$

12. a) Derive Planck's law of black body radiation from Bose-Einstein statistics.
- b) A system has three energy states  $\epsilon$ ,  $2\epsilon$  and  $3\epsilon$ .  $\psi_1$ ,  $\psi_2$  and  $\psi_3$  are the corresponding normalized wave functions. At an instant the system is in a superpose state  $\psi + c_1\psi_1 + c_2\psi_2 + c_3\psi_3$  and  $c_1 = \sqrt{(1/3)}$  and  $c_2 = \sqrt{(1/3)}$ .
- i) Find  $c_3$  if  $\psi$  is normalized.
- ii) Find out the expectation value of energy.
- c) Derive the Maxwell's wave equation for a charge free non-conducting medium. Hence prove that speed of light in a non-conducting medium is less than the speed of light in vacuum.  $5 + (2 + 3) + 5$

CS/B.TECH(N)/EVEN/SEM-2/BSM-201(N)/2018-19



**MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL**

Paper Code : BSM-201(N)

**MATHEMATICS-IIA**

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

**GROUP - A**  
**( Multiple Choice Type Questions )**

1. Choose the correct alternatives for any ten of the following : 10 × 1 = 10

i) If  $P(A) = 1/3$ ,  $P(B) = 1/4$ ,  $P(A \cup B) = 1/2$  then  $P(B/A)$  is

- a)  $\frac{3}{4}$
- b)  $\frac{4}{3}$
- c)  $\frac{1}{4}$
- d)  $\frac{1}{3}$

ii) The random variable  $X$  has distribution function  $F$ . If  $F(0) = 1/6$ ,  $F(1) = 1/2$ ,  $F(3) = 3/4$  then

- $P(0 < X \leq 3)$  is
- a)  $\frac{3}{4}$
  - b)  $\frac{1}{3}$
  - c)  $\frac{7}{12}$
  - d) none of these.

5/4

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iii) If the random variable  $X$  has Binomial distribution with parameters  $n$  &  $p$  then the mean and variance are respectively

- a)  $np$  &  $np(1-p)$       b)  $n/p$  &  $2n(1-p)$   
c)  $np(1-p)$  &  $np$       d) none of these.

iv) The distribution function  $F(x)$  of a random variable  $X$  is given by

- a)  $P(-\infty < X < \infty)$       b)  $P(-\infty < X \leq x)$   
c)  $P(-\infty \leq X < \infty)$       d) none of these.

v) For two random variable  $X$  and  $Y$  are independent, then

- a)  $E(XY) = E(X)E(Y)$   
b)  $E(XY) = E(X) + E(Y)$   
c)  $E(XY) = E(X) / E(Y)$   
d) none of these.

vi) The maximum likelihood estimate is a solution of the equation

a)  $\frac{\partial L(\theta)}{\partial \theta} = 0$

b)  $\frac{\partial L(\theta)}{\partial \theta} = \text{const.}$

c)  $\frac{\partial L(\theta)}{\partial \theta} = \theta$

d) none of these.

vii) A statistic  $t$  is said to be an unbiased estimator of a population parameter  $\theta$  when

a)  $E(t) = \theta$

b)  $E(t^2) = \theta$

c)  $E(t^2) = [E(\theta)]^2$

d)  $E(t^2) = [E(t)]^2$

viii) The probability of sample space is

a) 1

b)  $\frac{1}{2}$

c) 0

d) none of these.

ix) For two events,  $P(A) = 0.4$ ,  $P(B) = x$  and  $P(A + B) = 0.7$ . The value of  $x$  for which  $A$  and  $B$  will be mutually exclusive is

a)  $2/10$

b)  $3/10$

c)  $2/5$

d)  $1/5$



x) The number of ways 10 persons can occupy 10 chairs arranged at a round table is

- a)  $10! - 1$                       b)  $9! - 1$   
c)  $10!$                               d)  $9!$

xi) The probability  $P(a \leq x \leq b)$  is defined by  $F(x)$  (where  $F(x)$  is the distribution function of the random variable  $X$ ) <http://www.makaut.com>

- a)  $F(b) - F(a)$                       b)  $F(b) + F(a)$   
c)  $F(a) - F(b)$                       d)  $F(a) F(b)$

xii) A random variable  $X$  has the following p.m.f :

$x:$	1	2	3
$f(x):$	$\frac{1}{2}$	$\frac{1}{3}$	$k$

Then the value of  $k$  is

- a) 1                                      b) 0  
c)  $\frac{5}{6}$                                       d)  $\frac{1}{6}$

xiii) A random variable has a Poisson distribution such that  $P(1) = P(2)$ . Then the s. d. of  $X$  is

- a) 0                                      b) 2  
c)  $\sqrt{2}$                                       d) -2

**GROUP - B**

**( Short Answer Type Questions )**

Answer any *three* of the following.  $3 \times 5 = 15$

2. In a bolt factory, machines A, B and C manufacture respectively 25%, 35% and 40% of the total output. 5%, 4% and 2% are defective bolts. A bolt is drawn at random from the product and is found to be defective. What are the probabilities that it was manufactured by machines A, B and C?

3. Find mean and variance of binomial distribution.

4. Prove that  $-1 \leq \rho_{xy} \leq 1$ , where  $\rho_{xy}$  denotes correlation coefficient between  $x$  and  $y$ .

5. The distribution function  $F(x)$  of a variable  $X$  is defined as follows :

$$F(x) = A, -\infty < x < -1$$

$$= B, -1 \leq x < 0$$

$$= C, 0 \leq x < 2$$

$$= D, 2 \leq x < \infty$$

where A, B, C, D are constant. Determine the values of A, B, C and D given that  $P(X=0) = \frac{1}{6}$  and  $P(X>1) = \frac{2}{3}$ .

6. A box contains five defective and 10 non-defective lamps. Eight lamps are drawn at random in succession without replacement. What is the probability that eighth lamp is the fifth defective ?

**GROUP - C**

**( Long Answer Type Questions )**

Answer any *three* of the following.  $3 \times 15 = 45$

7. a) What is the axiomatic definition of probability ?  
b) For two vents  $A$  and  $B$  which are not necessarily exclusive, prove that

$$P(A \cup B) = P(A) + P(B) - P(A \cap B).$$

- c) Two bags contains respectively 3 white and 2 red balls, 2 white and 4 red balls. One ball is drawn at random from the first bag and is put into the second; then a ball is drawn from the second bag. What is the probability that the ball drawn from the second bag is white ?

- d) If  $A$  and  $B$  are two events, prove that

$$P(A/B) = 1 - P(A^c/B), P(B) > 0.$$

$$2 + 5 + 5 + 3$$

8. a) Two discrete random variable  $X$  and  $Y$  are connected by the relation  $2X + 3Y + 4 = 0$ . Prove that the correlation coefficient between  $X$  and  $Y$  is  $-1$ .
- b) Suppose that during rainy season, on a tropical island, the length of shower has an exponential distribution with average length of shower  $\frac{1}{2}$  mins. What is the probability that a shower will last more than three times? If a shower has already lasted for 2 minutes, what is the probability that it will last for at least one more minute?
- c) The joint probability density function ( pdf ) of a bivariate  $( X, Y )$  is

$$f(x, y) = C(x + y), x < 0, y > 0, x + y < 2$$
$$= 0, \text{ elsewhere}$$

Find  $C$  and  $P(X < 1, Y > 1/2)$ .

5 + 5 + 5

- 9 a) The median and mode of the following frequency distribution are known to be 27 and 26 respectively. Find the values of  $a$  and  $b$ .

<b>Class interval :</b>	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50
<b>Frequency :</b>	3	$a$	20	12	$b$

- b) The scores of two batsman A and B in 10 innings are :

<b>A :</b>	19	31	48	53	67	90	10	62	40	80
<b>B :</b>	32	28	47	63	71	39	10	60	96	14

Find which batsman is more consistent in scoring.

- c) The radius of a circle has distribution given by the probability density function :

$$f(x) = 1, 1 < x < 2$$

$$= 0, \text{ elsewhere}$$

Find the mean and variance of the area of the circle.

$$5 + 5 + 5$$

10. a) Fit a second degree parabola,  $y = a + bx + cx^2$ , to

the following data :

x:	0	1	2	3	4
y:	1	5	10	22	38

Predict  $y$  when  $x = 4.8$ .

b) A normal population has a mean 0.1 and standard deviation 2.1. Find the probability that the mean of a sample of size 900 will be negative. Given that

$$P(|x| < 1.43) = 0.847.$$

c) In order to test whether a coin is perfect the coin tossed 5 times. The null hypothesis of perfectness is rejected if more than 4 heads are obtained. What is the probability of Type I Error ? Find the probability of Type II Error when the corresponding probability of head is 0.2. 5 + 5 + 5

11. a) A machine part was designed to withstand an average pressure of 120 units. A random sample of size 100 from a large batch was tested and it was found that the average pressure which these parts can withstand is 105 units with a s.d of 20 units. Test at 5% level wheter the batch meet the specification. Suppose the population has normal distribution.

b) Survey of 320 families with 5 children each revealed the following distribution :

<b>No. of boys :</b>	5	4	3	2	1	0
<b>No. of girls :</b>	0	1	2	3	4	5
<b>No. of family :</b>	14	56	110	88	40	12

Is the result consistent with the hypothesis that male and female births are equally probable ? The 5% value of  $\chi^2$  with 5 d.o.f is 11.07.

c) Two scanners are needed for an experiment of the five available, two have electronic defects, one has defect in memory and two are in good working condition. Two units are selected at random. Let  $X_1$  = Number of units with electronic defects,  $X_2$  = Number of units with defect in memory.

- i) Find the joint distribution of  $X_1$  and  $X_2$ .
- ii) Find the probability of no or one defects among the selected two items.
- iii) Find the marginal distribution of  $X_1$ .

5 + 5 + 5

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**MAULANA ABUL KALAM AZAD UNIVERSITY OF  
TECHNOLOGY, WEST BENGAL**

**Paper Code : CE-302**

**SURVEYING**

*Time Allotted: 3 Hours*

*Full Marks: 70*

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words  
as far as practicable.*

**Group – A**

**(Multiple Choice Type Questions)**

- I. Choose the correct alternatives for any ten of the following:** 1×10=10
- (i) The process of determining the location of the station (on the map) occupied by the plane table is known as <http://www.makaut.com>
- (a) intersection (b) three point problem  
(c) traversing (d) resection
- (ii) In a closed traverse with five sides, the error found from the fore bearing and back bearing of the last line is  $+2^\circ$ , the correction to the third line will be
- (a)  $0^\circ 24'$  (b)  $0^\circ 48'$   
(c)  $0^\circ 12'$  (d)  $1^\circ 36'$
- (iii) The multiplication constant for the tachometer is
- (a)  $f/i$  (b)  $i/f$   
(c)  $f/d$  (d)  $f + d$
- (iv) At the equator the dip of the needle is
- (a)  $0^\circ$  (b)  $90^\circ$   
(c)  $45^\circ$  (d)  $180^\circ$
- (v) The face left position is also called <http://www.makaut.com>
- (a) telescope upward (b) telescope downward  
(c) telescope normal (d) telescope inverted

- (vi) The radius of a one-degree curve is
- (a) 1719 m (b) 1760 m  
(c) 2000 m (d) 2719 m
- (vii) The stadia diaphragm is provided for measuring <http://www.makaut.com>
- (a) elevation (b) reduced bearing  
(c) horizontal distance (d) WCB
- (viii) A theodolite in which the telescope can be revolved through a complete revolution in a vertical plane is known as a
- (a) transit theodolite (b) non-transit theodolite  
(c) tilting theodolite (d) moving theodolite
- (ix) Working edge of an alidade is known as
- (a) fiducial edge (b) bevelled edge  
(c) parallel edge (d) graduated edge
- (x) The principle of chain surveying is
- (a) traversing (b) triangulation  
(c) parallelism (d) None of these
- (xi) Which of the following marks the end of a chain line?
- (a) Arrow (b) Peg  
(c) Ranging rod (d) Cross staff
- (xii) When higher values are inside the loop, it indicates
- (a) hill (b) pond  
(c) sloping ground (d) depression

**Group – B**

**(Short Answer Type Questions)**

Answer any three of the following.

5×3=15

2. What is orientation? Describe any one method of orientation. <http://www.makaut.com>
3. The fore and back bearing of a line AB were observed to be N48°45'E and S58°12'E. If the magnetic declination at the place is known to be 1°55'W, find the true bearing of the lines in whole circle bearing system.

4. Mention the distance formulae for finding distances using a theodolite for a horizontal line of sight? Find the stadia constants K and C from the following data where the line of sight was horizontal in both cases:

Instrument at	Observation to	Distance	Staff readings
O	A	70 m	1.454, 1.623, 1.789
O	B	150 m	1.272, 1.735, 2.157

5. A 30 m chain was tested before the commencement of the day's work and found to be correct. After chaining 940 m the chain was found to be 0.07 m too long. At the end of day's work, after chaining a total distance of 1376 m the chain was found to be 0.12 m too long. What was the true distance chained?
6. The following perpendicular offsets were taken from a chain line to an irregular boundary:

Chainage (m)	0	10	20	30	40	50	60
Offset (m)	3.1	3.7	5.1	5.65	6.2	6.35	7.10

Find the area by Trapezoidal method and Simpson's Method. <http://www.makaut.com>

**Group – C**

**(Long Answer Type Questions)**

**Answer any three of the following.**

15×3=45

7. (a) The following are the bearings taken on a closed compass traverse. Compute the internal angles and correct them for observational errors. Also find out the corrected bearings of the lines applying the correction for local attraction:

Line	F.B.	B.B.
AB	80°10'	259°00'
BC	120°20'	301°50'
CD	170°50'	350°30'
DE	230°10'	49°30'
EA	310°20'	130°15'

- (b) What is 'closing error' in a traverse? Explain the Bowditch's rule to eliminate closing error in a traverse with proper diagram. <http://www.makaut.com>

10+5=15

8. (a) Briefly mention the fundamental adjustments of a theodolite.
- (b) In a tacheometric survey the following observations were taken where the staff was held vertically upon the point and the instrument is fitted with an analytical lens and the constant of the instrument being 100. Compute the RL of Q and the distance between P and Q:

Instrument Station	Height of Instrument	Staff Station	Vertical Angle	Staff readings (m)	Remark
A	1.45	BM	$-4^{\circ}20'$	1.315, 1.775, 2.225	RL of BM = 220 m
B	1.45	P	$6^{\circ}30'$	0.865, 1.680, 2.350	
Q	1.40	P	$-7^{\circ}24'$	1.615, 2.335, 2.715	

5+10=15

9. (a) Derive the relation between radius and degree of curve? <http://www.makaut.com>
- (b) A two lane pavement on a National Highway has a curve of radius 235 m, where two tangents intersect at a chainage of 1.350 m. The angle of intersection is  $160^{\circ}$  and peg intervals were taken as 20 m. Calculate all the necessary data for setting out the curve by preparing a setting out table when the least count of the vernier is 20".

5+10=15

10. Write short notes for the followings (*any five*):
- (a) Well conditioned triangle
- (b) Local attraction
- (c) Plane and geodetic survey
- (d) Contour interval
- (e) Latitude and departure
- (f) Errors in tacheometry
- (g) Transition curve <http://www.makaut.com>

3×5=15

11. (a) The following staff readings were observed successively with a level, the instrument having been moved after third, sixth and eighth readings: 2.225, 1.605, 0.995, 2.090, 2.865, 1.265, 0.600, 1.985, 1.045, 2.685 m. Enter the above readings in a page of level book and calculate the reduced levels of all the points if the first reading was taken with a staff held on benchmark of 135.75 m.

- (b) What do you mean by face left and face right observation? Why both the observations are required?

10+(2+3)=15



**MAULANA ABUL KALAM AZAD UNIVERSITY OF  
TECHNOLOGY, WEST BENGAL**

**Paper Code : CE-302**

**SURVEYING**

*Time Allotted: 3 Hours*

*Full Marks: 70*

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**Group – B**

**(Short Answer Type Questions)**

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2. What is orientation? Describe any one method of orientation. <http://www.makaut.com>
3. The fore and back bearing of a line AB were observed to be  $N48^{\circ}45'E$  and  $S58^{\circ}12'E$ . If the magnetic declination at the place is known to be  $1^{\circ}55'W$ , find the true bearing of the lines in whole circle bearing system.

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**Group – C**

**(Long Answer Type Questions)**

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15×3=45

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- 5+10=15
10. Write short notes for the followings (*any five*):
- 3×5=15
- Well conditioned triangle
  - Local attraction
  - Plane and geodetic survey
  - Contour interval
  - Latitude and departure
  - Errors in tacheometry
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- (b) What do you mean by face left and face right observation? Why both the observations are required?

10+(2+3)=15



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CS/B.TECH/ECE/ODD/SEM-3/EC-302/2017-18



**MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL**

Paper Code : EC-302

**SOLID STATE DEVICES**

Time Allotted : 3 Hours

Full Marks : 70

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words as far as practicable.*

**GROUP - A**

**( Multiple Choice Type Questions )**

1. Choose the correct alternatives for any ten of the following : 10 × 1 = 10

- i) Solar cell is a
  - a) photodetector
  - b) photodiode
  - c) photovoltaic device
  - d) optical emitter.

- ii) Which of the following is not a negative resistance device ?
  - a) Tunnel diode
  - b) Zener diode
  - c) Impatt diode
  - d) Gunn diode.
- iii) If  $V$  is the voltage applied to the metal with respect to the  $p$ -type semiconductor in a MOS capacitor then  $V < 0$  corresponds to
  - a) Depletion
  - b) Accumulation
  - c) Inversion
  - d) Strong Inversion.
- iv) When a positive voltage is applied to a  $p-n$  junction, the barrier potential will be
  - a) decreased
  - b) increased
  - c) unchanged
  - d) none of these.
- v) Effective electron mass depends on
  - a) temperature
  - b) doping concentration
  - c) bandgap
  - d) curvature.

- vi) In case of BJT, the base width should be narrow to minimize
  - a) drift current
  - b) diffusion current
  - c) recombination current
  - d) tunnelling current.
- vii) To turn off SCR, it is necessary to reduce its current to less
  - a) Trigger current
  - b) Holding current
  - c) Break-over current
  - d) none of these.
- viii) Photodiode operates in
  - a) reverse bias
  - b) forward bias
  - c) without bias
  - d) none of these.

- ix) A transistor configuration having highest current gain
  - a) Common base
  - b) Common collector
  - c) Common emitter
  - d) Emitter follower.
- x) Metal n-type semiconductor form Ohmic contact if
 

a) $\phi_m > \phi_s$	b) $\phi_m = \phi_s$
c) $\phi_m = 2\phi_s$	<input checked="" type="checkbox"/> d) $\phi_m < \phi_s$
- xi) Intrinsic carrier concentration depends on
  - a) bandgap
  - b) temperature
  - c) both (a) and (b)
  - d) none of these.
- xii) Above Pinch off voltage in a JFET the current
  - a) decreases
  - b) becomes saturated
  - c) increases sharply
  - d) none of these.

**GROUP - B**

**( Short Answer Type Questions )**

Answer any three of the following 3 × 5 = 15

- 2. a) What is density of states?
- b) Explain the plot of Fermi-Dirac distribution function with energy for different temperatures.
- c) A volt is applied across a 1 cm long Si bar. Determine mobility with the drift velocity is 104 cm/s. 1 + 2 + 2
- 3. a) What are mobility and conductivity?
- b) What are the effects of temperature and doping on mobility? 2 + 3
- 4. a) What is meant by DC operating point or Q point in the context of transistor characteristics?
- b) What is load line? Why is biasing necessary? 2 + 3
- 5. What is early effect? Explain how the early effect modifies the input current in case of CB and CE configuration of an n-p-n transistor. 2 + 3

- 6. What are direct band gap and indirect band gap semiconductor? Draw the E-K diagram of Si and GaAs.

2 + 3

**GROUP - C**

**( Long Answer Type Questions )**

Answer any three of the following. 3 × 15 = 45

- 7. a) Draw the V-I characteristics of JFET & explain it.
- b) Draw the small signal model.
- c) JFET has  $V_p = 4.5$  V,  $I_{DSS} = 10$  mA and  $I_{DS} = 2.5$  mA. Determine the transconductance. 8 + 2 + 5
- 8. (a) Describe briefly the principle of operation of a tunnel diode. Draw The I-V characteristics and mention the -ve resistance region.
- (b) What is Thermal runaway?
- c) What is photo transistor? 5 + 3 + 3 + 4
- 9. (a) Derive the equation for the different current components in a BJT by Ebers-Moll model.

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- b) Describe the basic structure of schottky diode and explain why it is suitable for high frequency operation. 10 + 3 + 2
10. a) What is heterojunction ? What are the difference between schottky contact and ohmic contact ?
- b) Show that for intrinsic semiconductor, the energy of Fermi level,  $E_F = (E_C + E_V)/2$ , where  $E_C$  and  $E_V$  are energy of conduction band and valance band. 2 + 3 + 10
11. Write short notes on any *three* of the following : 3 × 5
- (a) Varactor diode
  - b) Hall effect
  - c) Effective cell
  - (d) Solar cell
  - e) PIN photodiode
  - f) Channel length modulation.
-



**MAULANA ABUL KALAM AZAD UNIVERSITY OF  
TECHNOLOGY, WEST BENGAL**

**Paper Code :EC(EI)-301**

**DIGITAL ELECTRONIC CIRCUITS**

*Time Allotted:3 Hours*

*Full Marks: 70*

*The figures in the margin indicate full marks.  
Candidates are required to give their answers in their own words  
as far as practicable.*

**Group - A**

**(Multiple Choice Type Questions)**

1. Answer any ten questions: <http://www.makaut.com> 1×10=10

(i) The minimum number of NAND gate required to design a single XOR gate is

- ✓ (a) 5 (b) 3  
 (c) 4 (d) 6

(ii) The logic family which gives the fastest switching speed is

- ✓ (a) ECL (b) Schottky TTL  
 (c) CMOS (d) Low Power Schottky TTL

(iii)  $Y = AB + \bar{A}B + A\bar{B}$

- (a) All are minterms (b) The function is in canonical form  
 ✓ (c) Both are true (d) None of them

(iv) The following operation is equivalent to <http://www.makaut.com>



- (a) A buffer or delayed gate (b) An inverter  
 (c) Adder (d) None of them

**Turn Over**

(vi) 10MHz clock signal is applied to a MOD-4 counter followed by a MOD-5 counter then the output clock frequency will be

- (a) 50 kHz (b) 5 MHz  
(c) 5 kHz (d) 500 kHz

0111 1001 0011

(vii) BCD equivalent of  $(293)_{10}$  is <http://www.makaut.com>

- (a) 0111 0010 0011 (b) 1011 1001 0011  
(c) 0111 1001 0101 (d) 0111 0100 0111

(viii) If  $(511)_x = (777)_8$  then the value of  $x$  is

- (a) 6 (b) 7  
(c) 5 (d) 3

(ix) A single bit memory device is

- (a) ROM (b) RAM  
(c) FLIP-FLOP (d) PROM

(x) The operation of a flip-flop is analogous to

- (a) Astable multivibrator (b) Monostable multivibrator  
(c) Bistable multivibrator (d) None of these

(xi) For a N-bit weighted register D/A converter number of resistors required is

- (a) 2N (b) N  
(c) 2N-1 (d) N-1

(xii) The minterms for  $F(A,B,C) = A + \overline{BC} + BC$  are <http://www.makaut.com>

- (a)  $\sum m(0,1,2,3,4,6)$  (b)  $\sum m(0,3,4,5,6,7)$   
(c)  $\sum m(1,3,4,5,6,7)$  (d)  $\sum m(0,2,3,4,5,7)$

(xiii) A ring counter consists of 6 flip-flops will have

- (a) 12 states (b) 6 states  
(c) 11 states (d) 5 states

**Group - B**

(Short Answer Type Questions)

Answer any three of the following.

5×3=15

1. Using the theorem of Boolean logic prove that

$$(A + B).(\overline{A\overline{B}} + C).(\overline{A\overline{C}} + \overline{B}) = \overline{A}B + B\overline{C}$$

2. Simplify  $F(A,B,C,D) = \sum m(1,3,7,11,15) + \sum M(0,2,5)$  using k-map and realize the simplified expression using NAND gates only 2+2+1=5

3. Design a 4 bit adder/subtractor module using full adder and necessary gates with an add/subtract control line.

4. Implement the function  $F(A,B,C,D) = \sum m(1,2,3,7,8,9,11,15)$  using a single 8-1 MUX considering A,B,D as a select lines.

5. Design a 4 bit universal shift register using 4-1 MUX and other gates. <http://www.makaut.com>

**Group - C**

(Long Answer Type Questions)

Answer any three of the following.

15×3=45

7. Find the minimal expression for the function  $F(A,B,C,D) = \sum m(1,3,4,5,9,10,11) + \sum d(6,8)$  using Quine McClusky method and also realize the expression using only two input basic logic gates. 12+3=15

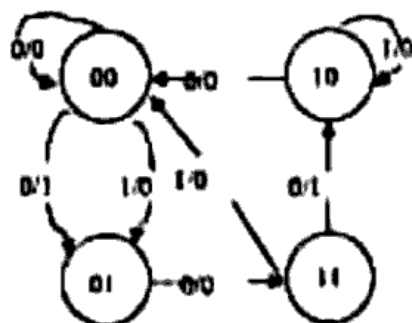
8. (a) What did you mean by Race around condition? How it can be eliminated using Master Slave flip-flop?

(b) Realize a T flip-flop using SR flip-flop.

(c) How do you cascade two 2-4 decoders to make one 3-8 decoder? Draw the necessary circuit.

(2+4)+6+3=15

9. (a) Design a clocked synchronous sequential network using J-K flip-flop and other gates whose state diagram is given below. <http://www.makaut.com>



(b) Design a mod-5 ripple counter using J-K flip-flop.

10×5=15

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10. (a) Explain the operation of a 4 bit R-2R ladder digital to analog converter.  
(b) For the same circuit assume that the feedback resistance of the op amp is variable, the resistance  $R=10K\text{-ohm}$  and reference voltage  $V_R=10V$ . Determine the value of  $R_f$  that should be connected to achieve the following output conditions:
- (i) The value of 1 LSB at the output is 0.5 V
  - (ii) An analog output of 6 V for a binary input of 1010.
  - (iii) The full scale output voltage of 12 V.
  - (iv) The actual maximum output voltage of 10 V. 7+8=15

11. Write short notes on *any three* of the following: <http://www.makaut.com> 5×3=15

- (i) Basic principle of successive approximation type A/D converter
  - (ii) Parity Generator
  - (iii) Johnson counter
  - (iv) Parallel in Serial Out Register
  - (v) EEROM
-





**MAULANA ABUL KALAM AZAD UNIVERSITY OF  
TECHNOLOGY, WEST BENGAL**

**Paper Code :EC(EI)-301**

**DIGITAL ELECTRONIC CIRCUITS**

*Time Allotted:3 Hours*

*Full Marks: 70*

*The figures in the margin indicate full marks.  
Candidates are required to give their answers in their own words  
as far as practicable.*

**Group - A**

**(Multiple Choice Type Questions)**

1. Answer any ten questions: <http://www.makaut.com>

1×10=10

(i) The minimum number of NAND gate required to design a single XOR gate is

- (a) 5 (b) 3  
(c) 4 (d) 6

(ii) The logic family which gives the fastest switching speed is

- (a) ECL (b) Schottky TTL  
(c) CMOS (d) Low Power Schottky TTL

(iii)  $Y = AB + \bar{A}B + A\bar{B}$

- (a) All are minterms (b) The function is in canonical form  
(c) Both are true (d) None of them

(iv) The following operation is equivalent to <http://www.makaut.com>



- (a) A buffer or delayed gate (b) An inverter  
(c) Adder (d) None of them

**Turn Over**

(vi) 10MHz clock signal is applied to a MOD-4 counter followed by a MOD-5 counter then the output clock frequency will be

- (a) 50 kHz
- (b) 5 MHz
- (c) 5 kHz
- (d) 500 kHz

0111 1001 0011

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- (a) 0111 0010 0011
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(viii) If  $(511)_x = (777)_8$  then the value of  $x$  is

- (a) 6
- (b) 7
- (c) 5
- (d) 3

(ix) A single bit memory device is

- (a) ROM
- (b) RAM
- (c) FLIP-FLOP
- (d) PROM

(x) The operation of a flip-flop is analogous to

- (a) Astable multivibrator
- (b) Monostable multivibrator
- (c) Bistable multivibrator
- (d) None of these

(xi) For a N-bit weighted register D/A converter number of resistors required is

- (a)  $2N$
- (b)  $N$
- (c)  $2N-1$
- (d)  $N-1$

(xii) The minterms for  $F(A,B,C) = A + \overline{BC} + BC$  are <http://www.makaut.com>

- (a)  $\sum m(0,1,2,3,4,6)$
- (b)  $\sum m(0,3,4,5,6,7)$
- (c)  $\sum m(1,3,4,5,6,7)$
- (d)  $\sum m(0,2,3,4,5,7)$

(xiii) A ring counter consists of 6 flip-flops will have

- (a) 12 states
- (b) 6 states
- (c) 11 states
- (d) 5 states

**Group - B**

(Short Answer Type Questions)

Answer any three of the following.

5×3=15

1. Using the theorem of Boolean logic prove that

$$(A + B).(\overline{A\overline{C}} + C).(\overline{AC + B}) = \overline{A}B + B\overline{C}$$

2. Simplify  $F(A,B,C,D) = \sum m(1,3,7,11,15) + \sum M(0,2,5)$  using k-map and realize the simplified expression using NAND gates only 2+2+1=5

3. Design a 4 bit adder/subtractor module using full adder and necessary gates with an add/subtract control line.

4. Implement the function  $F(A,B,C,D) = \sum m(1,2,3,7,8,9,11,15)$  using a single 8:1 MUX considering A,B,D as a select lines.

5. Design a 4 bit universal shift register using 4:1 MUX and other gates. <http://www.makaut.com>

**Group - C**

(Long Answer Type Questions)

Answer any three of the following.

15×3=45

1. Find the minimal expression for the function  $F(A,B,C,D) = \sum m(1,3,4,5,9,10,11) + \sum d(6,8)$  using Quine McClusky method and also realize the expression using only two input basic logic gates. 12+3=15

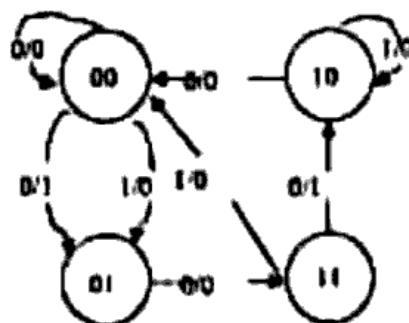
2. (a) What did you mean by Race around condition? How it can be eliminated using Master Slave flip-flop?

(b) Realize a T flip-flop using SR flip-flop.

(c) How do you cascade two 2:4 decoders to make one 3:8 decoder? Draw the necessary circuit.

(2+4)+6+3=15

3. (a) Design a clocked synchronous sequential network using J-K flip-flop and other gates whose state diagram is given below. <http://www.makaut.com>



(b) Design a mod-5 ripple counter using J-K flip-flop.

10+5=15

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10. (a) Explain the operation of a 4 bit R-2R ladder digital to analog converter.  
(b) For the same circuit assume that the feedback resistance of the op amp is variable, the resistance  $R=10K\text{-ohm}$  and reference voltage  $V_R=10V$ . Determine the value of  $R_f$  that should be connected to achieve the following output conditions:
- (i) The value of 1 LSB at the output is 0.5 V
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11. Write short notes on *any three* of the following: <http://www.makaut.com> 5x3=15

- (i) Basic principle of successive approximation type A/D converter
  - (ii) Parity Generator
  - (iii) Johnson counter
  - (iv) Parallel in Serial Out Register
  - (v) EEROM
-



**MAULANA ABUL KALAM AZAD UNIVERSITY OF  
TECHNOLOGY, WEST BENGAL**

**Paper Code :EC(EI)-302**

**ANALOG ELECTRONIC CIRCUIT**

**Time Allotted: 3 Hours**

**Full Marks: 70**

*The figures in the margin indicate full marks.  
Candidates are required to give their answers in their own words  
as far as practicable.*

**Group – A**

**(Multiple Choice Type Questions)**

**I. Choose the correct alternative for any ten of the following:**

**1×10=10**

(i) The feedback factor  $\beta$  at the frequency of oscillation of a Wien-bridge oscillator is

(a) 3

(b)  $1/3$

(c)  $1/29$

(d)  $3/29$

(ii) The use of crystal in a tunable oscillator

(a) improves frequency stability

(b) increases the gain of the oscillator

(c) helps to obtain optimum output impedance

(d) facilitates generation of wide range of frequencies

(iii) Which multivibrator is a square wave oscillator?

(a) monostable

(b) astable

(c) bistable

(d) None of the above

(iv) The function of a bleeder resistor in a power supply is

(a) the same as that of load resistor

(b) to ensure a minimum current drain in the circuit

(c) to increase the output dc voltage

(d) to increase the output current

**Turn Over**

- (xii) If a square wave is fed to a differentiating circuit, the output will be
- (a) sine wave
  - (b) sharp narrow pulses
  - (c) rectangular wave
  - (d) triangular wave

**Group - B**

(Short Answer Type Questions)

Answer any three of the following.

5×3=15.

2. Draw the circuit diagram of a two-stage RC coupled CE transistor amplifier and show how the magnitude and phase angle of its voltage gain vary with frequency.
3. Explain the operation of current mirror circuit. <http://www.makaut.com>
4. Explain the term transistor biasing. What are the factors determining the choice of Q-point? 2+3=5
5. Explain the operation of a series voltage regulator with proper circuit diagram.
6. For the ac equivalent circuit of a Hartley oscillator, determine the frequency of oscillation.

**Group - C**

(Long Answer Type Questions)

Answer any three of the following.

15×1=15.

7. (a) With necessary h-parameter equivalent circuit of low frequency CE mode transistor amplifier, calculate the following in terms of h-parameters:
  - (i) input resistance
  - (ii) power gain
- (b) An RC-coupled amplifier employs two identical transistors, each having  $h_{fe} = 100$ ,  $h_{ie} = 2k\Omega$  and  $C_{ob} = 2pF$ . The coupling capacitor has a capacitance  $C = 0.4\mu F$ . The load resistance for each transistor is  $R_L = 8k\Omega$ . Taking the wiring capacitance as  $C_w = 10pF$ , calculate the lower and upper half-power frequencies.
- (c) Explain the operation of voltage-to-current converter with
  - (i) floating load and
  - (ii) grounded load

(4+3)+4+(2+2)=15

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8. (a) Show that, at the lower half power frequency, the phase angle of an RC-coupled transistor amplifier is  $-225^\circ$ .
- (b) A silicon transistor with  $\beta = 50$ ,  $V_{BE} = 0.6V$ ,  $V_{CC} = 12V$  and  $R_C = 5.6K\Omega$  is used for self-biasing circuit. It is desirable to establish Q-point at  $V_{CE} = 12V$ ,  $I_C = 1.5mA$  and a stability factor  $S \leq 3$ . Find  $R_E = R_1$  and  $R_2$ .  
(The symbols have their usual meanings).
- (c) Explain how temperature compensation can be achieved for analog amplifier using Op-Amp.

6+4+5=15

9. (a) Using a suitable diagram, prove that the gain of an RC phase shift oscillator is 29.
- (b) What is the difference between Hartley and Colpitt's oscillator.
- (c) Explain the operation of the following two circuits:  
(i) Differential amplifier  
(ii) precision rectifier

6+3+(3+3)=15

10. (a) What do you mean by multivibrator?
- (b) With detailed circuit diagram, explain the operation of a monostable multivibrator circuit using 555 timer IC.
- (c) Derive the expression of frequency of oscillation for monostable multivibrator circuit using 555 timer IC.
- (d) Determine the positive pulse width, negative pulse width and free-running frequency for an astable multivibrator using 555 timer,  $R_A = 4.7K$ ,  $R_B = 1K$ ,  $C = 1\mu F$ ,  $C_1 = 0.01\mu F$ . What is the duty cycle of output waveform?

2+(3+3)+3+4=15

11. Write short notes on any three of the following:

5×3=15

- (i) Phase locked loop
- (ii) Analog amplifier
- (iii) SMPS
- (iv) Crystal oscillator
- (v) Schmitt trigger

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**MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL**

**Paper Code : EE-301  
ELECTRIC CIRCUIT THEORY**

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

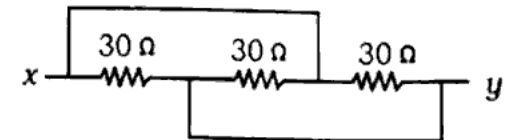
Candidates are required to give their answers in their own words as far as practicable.

**GROUP - A**

**( Multiple Choice Type Questions )**

1. Choose the correct alternatives for any ten of the following : 10 × 1 = 10
  - i) A tie-set matrix has 3 rows and 7 branches. The number of twigs is
    - a) 3
    - b) 5
    - c) 2
    - d) 4.
  - ii) If a function is shifted by  $T$ , then it is correctly represented as
    - a)  $f(t - T) u(t)$
    - b)  $f(t - T) u(t - T)$
    - c)  $f(t) u(t - T)$
    - d)  $(t - T) f(t - T)$
  - iii) If all the elements in a particular network are linear, then the superposition theorem would hold, when the excitation is
    - a) DC only
    - b) AC only
    - c) either AC or DC
    - d) an Impulse.

- iv) In balanced bridge, if the positions of detector and source are interchanged, the bridge will still remain balanced. This can be explained from which theorem ?
  - a) Reciprocity theorem
  - b) Thevenin's theorem
  - c) Norton's theorem
  - d) Compensation theorem.
- v) When we use super node technique
  - a) Current source branch is common for two meshes
  - b) Ideal voltage source is connected between two non-reference nodes
  - c) Ideal voltage source is connected between non-reference node and reference
  - d) All of these.
- vi) The number of links of a graph having  $n$  nodes and  $b$  branches are
  - a)  $b - n + 1$
  - b)  $b + n - 1$
  - c)  $n - b + 1$
  - d)  $b + n$ .
- vii) The equivalent resistance between  $x$  &  $y$  of the figure shown below is



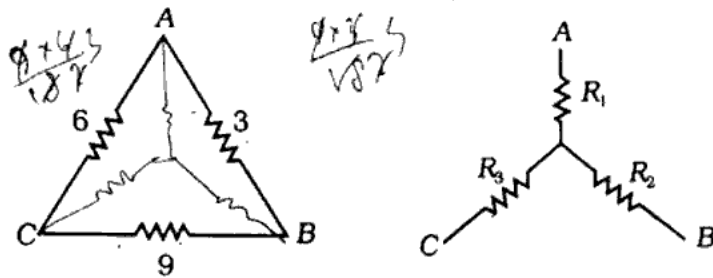
- a) 30 ohm
  - b) 50 ohm
  - c) 60 ohm
  - d) 10 ohm.
- viii) A network with 5 independent loops and 7 nodes will have number of branches in the network
    - a) 10
    - b) 7
    - c) 4
    - d) none of these.



- ix) A current in a circuit is given by  $I(s) = \frac{2s+8}{s^2+4s+12}$ . If the current flows through a  $5\ \Omega$  resistor, power dissipated at  $t = 0$  is
- a) 20 watt                      b) 15 watt  
c) 40 watt                      d) 10 watt.

- x) A network is linear if
- a) Response proportional to excitation function  
b) Principle of superposition applies  
c) Principle of homogeneity applies  
d) Both (b) and (c).

- xi) The resistances  $R_1$ ,  $R_2$  and  $R_3$  are respectively



- a) 1, 3/2 & 3                      b) 3, 3/2 & 3  
c) 9, 3 & 1                      d) 2, 1 & 9.

- xii) If poles and zeros are arranged alternatively on imaginary axis, then type of network is
- a) LC network                      b) RC network  
c) RL network                      d) Any of these.

**GROUP - B**  
**( Short Answer Type Questions )**

Answer any three of the following.  $3 \times 5 = 15$

2. Find  $v_x$  using source transformation technique in the given Fig. 1.

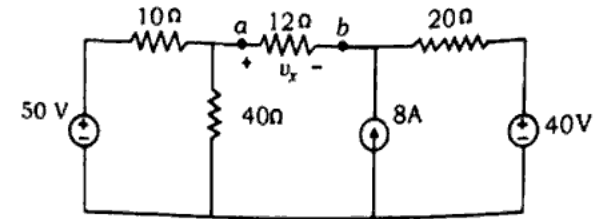


Fig.-1.

3. Apply superposition principle to find  $v_o$  and in the Fig. 2.

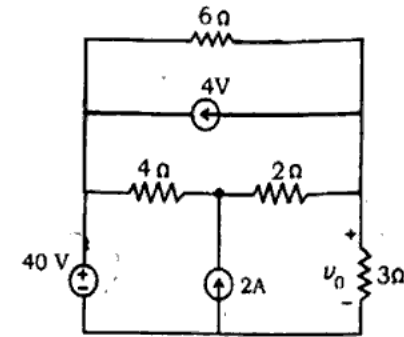


Fig.-2.

4. Find the incidence matrix of the given network in Fig. 3.

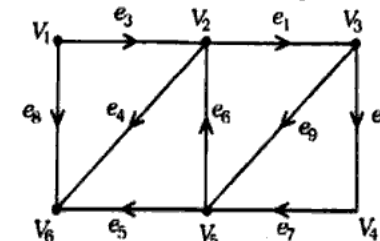


Fig.-3.

5. Find Norton equivalent circuit across  $a$  &  $b$  terminals from the Fig. 4.

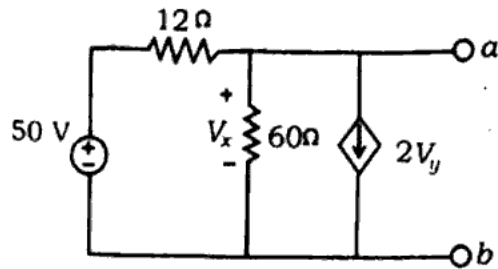


Fig.-4.

6. Find the Laplace transform of the periodic function in Fig. 5.

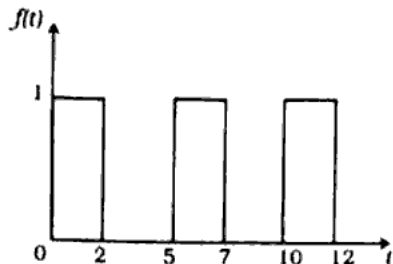


Fig.-5

**GROUP - C**

( Long Answer Type Questions )

Answer any three of the following.  $3 \times 15 = 45$

7. a) Find Thevenin equivalent at terminals  $a - b$  of the network in Fig. 6. 9

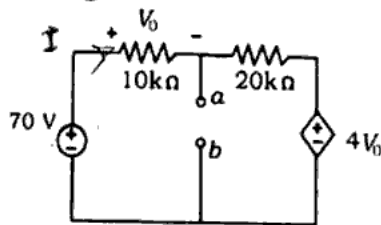


Fig.-6.

- b) Determine the Laplace transform of  $f(t) = t^2 * \sin(2t) * u(t)$ . 6

8. a) Solve for  $V_0$  using mesh analysis in Fig. 7. 8

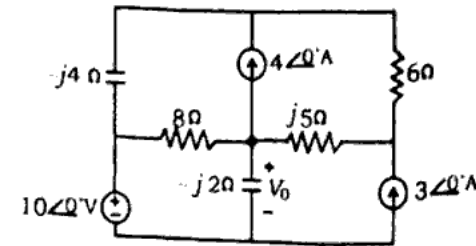
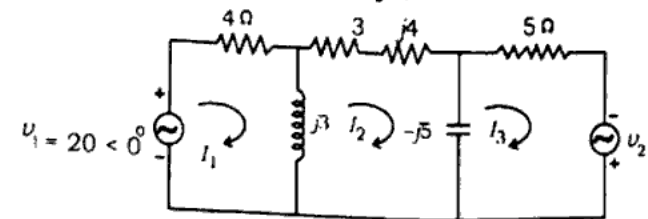


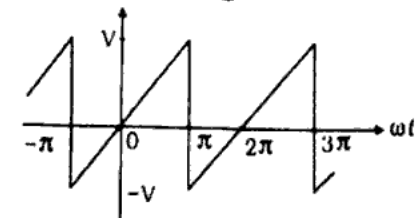
Fig.-7.

- b) Determine the value of  $v_2$  such that the current through impedance  $(3 + j4)\Omega$  is zero.



7

9. a) Find the Fourier expansion of the following waveform shown in figure.



- b) Determine the Fourier transform and sketch the amplitude and phase and phase spectrums of the functions

$$f(t) = Ve^{-t/a} \text{ for } t \geq 0$$

$$= 0 \text{ for } t < 0$$

8 + 7

10. Find out the fundamental cut-set matrix and fundamental tie-set matrix of Fig. 8.

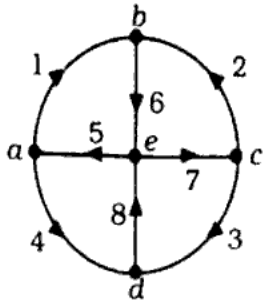


Fig. 8

11. a) A 2nd order active filter is shown in the Fig. 9 find out the transfer function of the filter and show that it is a low-pass filter. 9

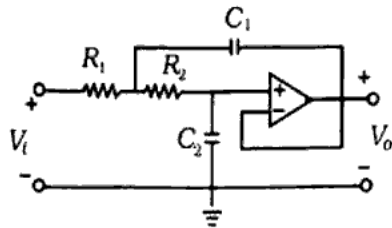


Fig. 9

b) Design a high-pass filter with a high frequency gain of 5 and a corner frequency of 2 kHz. Use a 0.1 μF capacitor in your design. 6



CS/B.TECH/ECE/ODD/SEM-3/EC-302/2017-18

CS/B.TECH/ECE/ODD/SEM-3/EC-302/2017-18



**MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL**

Paper Code : EC-302

**SOLID STATE DEVICES**

Time Allotted : 3 Hours

Full Marks : 70

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words as far as practicable.*

**GROUP - A**

**( Multiple Choice Type Questions )**

1. Choose the correct alternatives for any ten of the following : 10 × 1 = 10

- i) Solar cell is a
  - a) photodetector
  - b) photodiode
  - c) photovoltaic device
  - d) optical emitter.

- ii) Which of the following is not a negative resistance device ?
  - a) Tunnel diode
  - b) Zener diode
  - c) Impatt diode
  - d) Gunn diode.
- iii) If  $V$  is the voltage applied to the metal with respect to the  $p$ -type semiconductor in a MOS capacitor then  $V < 0$  corresponds to
  - a) Depletion
  - b) Accumulation
  - c) Inversion
  - d) Strong Inversion.
- iv) When a positive voltage is applied to a  $p-n$  junction, the barrier potential will be
  - a)  decreased
  - b) increased
  - c) unchanged
  - d) none of these.
- v) Effective electron mass depends on
  - a) temperature
  - b) doping concentration
  - c) bandgap
  - d) curvature.

- vi) In case of BJT, the base width should be narrow to minimize
  - a) drift current
  - b) diffusion current
  - c) recombination current
  - d) tunnelling current.
- vii) To turn off SCR, it is necessary to reduce its current to less
  - a) Trigger current
  - b) Holding current
  - c) Break-over current
  - d) none of these.
- viii) Photodiode operates in
  - a) reverse bias
  - b) forward bias
  - c) without bias
  - d) none of these.

- ix) A transistor configuration having highest current gain
  - a) Common base
  - b) Common collector
  - c) Common emitter
  - d) Emitter follower.
- x) Metal n-type semiconductor form Ohmic contact if
 

a) $\phi_m > \phi_s$	b) $\phi_m = \phi_s$
c) $\phi_m = 2\phi_s$	<input checked="" type="checkbox"/> d) $\phi_m < \phi_s$
- xi) Intrinsic carrier concentration depends on
  - a) bandgap
  - b) temperature
  - c) both (a) and (b)
  - d) none of these.
- xii) Above Pinch off voltage in a JFET the current
  - a) decreases
  - b) becomes saturated
  - c) increases sharply
  - d) none of these.

**GROUP - B**

**( Short Answer Type Questions )**

Answer any three of the following 3 × 5 = 15

- 2. a) What is density of states?
- b) Explain the plot of Fermi-Dirac distribution function with energy for different temperatures.
- c) A volt is applied across a 1 cm long Si bar. Determine mobility with the drift velocity is 104 cm/s. 1 + 2 + 2
- 3. a) What are mobility and conductivity?
- b) What are the effects of temperature and doping on mobility? 2 + 3
- 4. a) What is meant by DC operating point or Q point in the context of transistor characteristics?
- b) What is load line? Why is biasing necessary? 2 + 3
- 5. What is early effect? Explain how the early effect modifies the input current in case of CB and CE configuration of an n-p-n transistor. 2 + 3

- 6. What are direct band gap and indirect band gap semiconductor? Draw the E-K diagram of Si and GaAs.

2 + 3

**GROUP - C**

**( Long Answer Type Questions )**

Answer any three of the following. 3 × 15 = 45

- 7. a) Draw the V-I characteristics of JFET & explain it.
- b) Draw the small signal model.
- c) JFET has  $V_p = 4.5 \text{ V}$ ,  $I_{DSS} = 10 \text{ mA}$  and  $I_{DS} = 2.5 \text{ mA}$ . Determine the transconductance. 8 + 2 + 5
- 8. (a) Describe briefly the principle of operation of a tunnel diode. Draw The I-V characteristics and mention the -ve resistance region.
- (b) What is Thermal runaway?
- c) What is photo transistor? 5 + 3 + 3 + 4
- 9. (a) Derive the equation for the different current components in a BJT by Ebers-Moll model.

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- b) Describe the basic structure of schottky diode and explain why it is suitable for high frequency operation. 10 + 3 + 2
10. a) What is heterojunction ? What are the difference between schottky contact and ohmic contact ?
- b) Show that for intrinsic semiconductor, the energy of Fermi level,  $E_F = (E_C + E_V)/2$ , where  $E_C$  and  $E_V$  are energy of conduction band and valance band. 2 + 3 + 10
11. Write short notes on any *three* of the following : 3 × 5
- (a) Varactor diode
  - b) Hall effect
  - c) Effective cell
  - (d) Solar cell
  - e) PIN photodiode
  - f) Channel length modulation.

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**MAULANA ABUL KALAM AZAD UNIVERSITY OF  
TECHNOLOGY, WEST BENGAL**

**Paper Code : EE-302  
FIELD THEORY**

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

**GROUP - A**

**( Multiple Choice Type Questions )**

1. Choose the correct alternatives for any ten of the following : 10 × 1 = 10

i) Given vectors,  $\vec{A} = 2\vec{a}_x + \alpha\vec{a}_y + 2\vec{a}_z$  and  $\vec{B} = \alpha\vec{a}_x + \vec{a}_y + \vec{a}_z$ . If  $\vec{A}$  and  $\vec{B}$  are normal to each other then  $\alpha$  is

- a) 1 b)  $-\frac{2}{3}$   
c) -1 d) 0.

ii) The value of line integration along a circular path of radius 2 units is

- a) 0 b)  $2\pi$   
c)  $8\pi$  d)  $4\pi$ .

iii) A vector with zero divergence is

- a) irrotational b) a null vector  
c) a scalar d) solenoidal.

iv) Ohm's law is obeyed by

- a) Conduction current  
b) Convection current  
c) Conduction current & Convection current  
d) None of these.

v) The closed loop integral of electric field is zero, if the electric field is caused by

- a) a static charge  
b) a time varying magnetic field  
c) both (a) and (b)  
d) none of these.

vi) The magnetic field strength  $\vec{H}$  produced by an infinitely long conductor carrying current  $I$  at a distance  $r$  is given by

- a)  $\vec{H} = 2\pi r I$  b)  $\vec{H} = I/2\pi r$   
c)  $\vec{H} = I/4\pi r$  d)  $\vec{H} = 4\pi r/I$ .



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vii) The magnetic flux  $\vec{B}$  and vector potential  $\vec{A}$  are related as

a)  $\vec{B} = \nabla \times \vec{A}$

b)  $\vec{B} = \nabla \cdot \vec{A}$

c)  $\vec{A} = \nabla \times \vec{B}$

d)  $\vec{A} = \nabla \cdot \vec{B}$

viii) Which of the following is not Maxwell's equation ?

a)  $\nabla \cdot \vec{D} = \rho$

b)  $\nabla \times \vec{E} = -\frac{\partial \vec{B}}{\partial t}$

c)  $\nabla \times \vec{H} = \vec{J} + \frac{\partial \vec{D}}{\partial t}$

d)  $\nabla \cdot \vec{J} = -\frac{\partial \rho}{\partial t}$

ix) The mathematical form of Lorentz force is given by

a)  $\vec{F} = q\vec{E} + q\vec{v} \times \vec{B}$

b)  $\vec{F} = q\vec{E} + q\vec{v} \cdot \vec{B}$

c)  $\vec{F} = q\vec{E} + \vec{v} \cdot \vec{B}$

d)  $\vec{F} = \vec{E} + \vec{v} \cdot \vec{B}$

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x) The direction of propagation of electromagnetic waves is given by the direction of

a)  $\vec{E}$

b)  $\vec{H}$

c)  $\vec{E} \times \vec{H}$

d)  $\vec{E} \cdot \vec{H}$

xi) Capacitance of the earth of radius  $R$  is

a)  $2\pi\epsilon_0 R$

b)  $4\pi\epsilon_0 R$

c)  $\frac{4}{3}\pi\epsilon_0 R^3$

d)  $4\pi\epsilon_0 \frac{1}{R}$

xii) Curl of a gradient of a scalar function results in

a) non zero scalar

b) non-zero vector

c) zero vector

d) periodic function.

**GROUP - B**

( Short Answer Type Questions )

Answer any three of the following. 3 × 5 = 15

2. Explain the physical significance of the terms :
  - (i) divergence of a vector field
  - (ii) curl of a vector field.
3. Use Gauss's law to find the electric field at a point both
  - (i) Inside
  - (ii) Outside
 a uniformly charged sphere of radius  $a$ .
4. Establish force on current element  $d\vec{F} = Id\vec{l} \times \vec{B}$  from the expression of Lorentz force on moving charge in a uniform steady magnetic field.
5. State Ampere's circuital law and write its expressions in both integral and differential forms.
6. From the fundamental principle, establish the relation,  $\vec{\nabla} \times \vec{E} = -\partial\vec{B}/\partial t$ .

**GROUP - C**

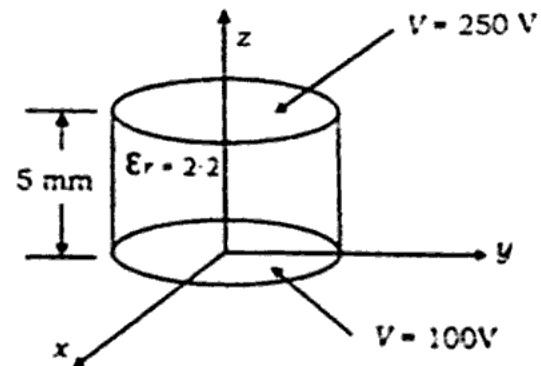
( Long Answer Type Questions )

Answer any three of the following. 3 × 5 = 15

7. a) Determine the magnetic flux density  $\vec{B}$  caused by a finite length of  $z$  at a distance  $d$  from the origin carrying current  $I$ .

- b) Apply Ampere's circuital law to the perimeter of a differential surface element and obtain the point form of Ampere's circuital law. 7 + 8

8. a) Derive the Maxwell's equations. 7 + 8
- b) Discuss Physical interpretation of Maxwell's equations. 10 + 5
9. a) An electric field in free space is given by  $\vec{E} = 50 \cos(10^8 t + \beta x) \hat{a}_y \text{ V/m}$ . Find out the direction of wave propagation and the phase constant of this wave. 2 + 2
- b) Find out the values of  $\alpha$  (attenuation constant) and  $\beta$  (phase constant) in case of propagation of wave in a lossy dielectric. Also find out the expression of intrinsic impedance for this case. 7 + 4
10. a) Write down general procedure for solving Poisson's and Laplace's equation. 6
- b) Two parallel conducting disks shown in the figure are separated by 5 mm and contain a dielectric for which  $\epsilon_r = 2.2$ . Determine the charge densities on the disk. 9



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11. a) State and prove Uniqueness theorem. 8
- b) For two spherical shells with radii 0.15 m and 0.25 m respectively, the potentials are 150 V and 0 V respectively. Assuming free space between the shells, determine the electric field intensity in free space. Also evaluate maximum value of  $\vec{E}$ . 7
12. a) Develop the analogy between uniform plane EM waves and the electric transmission line.
- b) A uniform transmission line has constants  $R = 12 \text{ m}\Omega/\text{m}$ ,  $G = 0.8 \text{ }\mu\Omega^{-1}/\text{m}$ ,  $L = 1.3 \text{ }\mu\text{H}/\text{m}$  and  $C = 0.7 \text{ nF}/\text{m}$ . At 5 kHz, find (i) impedance, (ii) dB attenuation in 2 km.
- c) What do you mean by linearly polarized plane E.M. waves in free space? 5 + 6 + 4
13. Write short notes on any three of the following : 3 x 5
- a) Magnetic scalar and vector potentials
- b) Continuity equation of current
- c) Energy density in electrostatic field
- d) Poynting vector.
-

**CS/B.TECH/CE/EVEN/SEM-4/CE-401/2018-19**



**MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL**

**Paper Code : CE-401**

**FLUID MECHANICS**

*Time Allotted : 3 Hours*

*Full Marks : 70*

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words as far as practicable.*

**GROUP - A**

**( Multiple Choice Type Questions )**

1. Choose the correct alternatives for any *ten* of the following : 10 × 1 = 10

i) For a right-angled triangular notch, the expression of discharge is  $Q = kH^{5/2}$ , where  $Q$  is the rate of discharge and  $H$  is the head of water above the notch ( consider coefficient of discharge  $C_d = 0.6$  ).

The magnitude of  $k$  is

- a) 1.147 ~~b) 1.714~~  
c) 1.471 d) 1.417.

ii) The side slope of the trapezoidal Cipolletti weir is  $x$  horizontal of  $y$  vertical. The value of  $x$  and  $y$  are respectively

- ~~a) 2, 1~~ b) 1, 2  
c) 1, 4 d) 4, 1.

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- iii) The position of centre of pressure of a circular plate immersed somewhere in water ( sp. gr. = 1.0 ) is 2 m below the free surface. What will be the position of centre of pressure of the same plate at same location immersed in oil of sp. gr = 0.8.
- a) 1.6 m
  - b) 2.0 m
  - c) 2.5 m
  - d) Insufficient data.
- iv) A stone weighs 392.4 N in air and 196.2 N in water. The specific gravity of the stone is
- a) 1.5
  - b) 2.0
  - c) 2.5
  - d) 3.0.
- v) For a floating body the condition of stable equilibrium is
- a) metacentre is above the centre of gravity of the body
  - b) centre of gravity is above the metacentre of the body
  - c) centre of gravity and metacentre act at same point
  - d) no conclusion can be drawn.
- vi) Hydraulic jump is an example of
- a) gradually varied uniform flow
  - b) gradually varied non-uniform flow
  - c) rapidly varied uniform flow
  - d) rapidly varied non-uniform flow.

- vii) Pelton wheel is
- a) impulse turbine
  - b) radial flow turbine
  - c) axial flow turbine
  - d) centrifugal pump.
- viii) Two circular pipes are connected in series for water supply between two reservoirs situated at different elevations. The length and diameter of first pipe is  $L$  and  $d$  respectively. If the length of the second pipe is  $32L$  then what will be its diameter if major frictional losses and friction factor are same for both pipes. <http://www.makaut.com>
- a)  $d$
  - b)  $32d$
  - c)  $d/32$
  - d)  $2d$ .
- ix) The metacentric height of a floating body is
- a) the distance between metacentre and centre of buoyancy
  - b) the distance between the centre of buoyancy and centre of gravity
  - c) the distance between metacentre and centre of gravity
  - d) none of these.
- x) Cavitation will take place if the pressure of the flowing fluid at any point is
- a) more than vapour pressure of the fluid
  - b) equal to vapour pressure of the fluid
  - c) is less than vapour pressure of the fluid
  - d) none of these.

- xi) To produce a high head by multistage centrifugal pump, the impellers are connected
- a) in parallel
  - b) in series
  - c) in parallel and in series
  - d) none of these.
- xii) The point, through which the weight is acting, is called
- a) centre of pressure
  - b) centre of gravity
  - c) centre of buoyancy
  - d) none of these.

**GROUP - B**

**( Short Answer Type Questions )**

Answer any *three* of the following.  $3 \times 5 = 15$

2. Write a short note on overall efficiency of a turbine. In case of turbine, how overall efficiency is related with hydraulic efficiency? With a neat sketch show the main working parts of a centrifugal pump.  $1\frac{1}{2} + \frac{1}{2} + 3$

3. Explain the working principle of Francis and Kaplan turbines.

4. The model of a boat is prepared to a scale 1 : 10 and towed in a water tunnel. If the speed of the boat is 20 m/sec., determine the towing speed of the model. Assume that the boat is subjected to only wave resistance.

5. Calculate the discharge through a pipe of diameter 300 mm when the difference of pressure head between two ends of pipe 450 m apart is 6.5 m of water. Take coefficient of friction,  $f = 0.009$
6. Discuss brief about stability of floating body.
7. A centrifugal pump delivers water against a net head of 14.5 m and a design speed of 1000 r.p.m. The vanes are curved back to an angle of  $30^\circ$  with the periphery. The impeller diameter is 300 mm and outlet width is 50 mm. Determine the discharge of the pump if manometric efficiency is 95%.

**GROUP - C**

**( Long Answer Type Questions )**

Answer any *three* of the following.  $3 \times 15 = 45$

8. a) Show that hydraulically most efficient trapezoidal section is half of a regular hexagon and its hydraulic radius is equal to half the depth of flow. 10
- b) What is specific energy ? Draw the specific energy curve. 5
9. a) A sluice gate discharges water into a horizontal rectangular channel with a velocity of 8 m/s and depth of flow is 0.5 m. The width of the channel is 6 m. Determine whether hydraulic jump will occur, and if so, find its height, loss of energy per kg of water and power loss is hydraulic jump. 10
- b) State the working principle of a Pelton wheel. 5



10. a) The force exerted by a flowing fluid on a stationary body depends upon length ( $L$ ) of the body, velocity ( $V$ ) of the fluid, density ( $\rho$ ) of fluid, viscosity ( $\mu$ ) of fluid, and acceleration ( $g$ ) due to gravity. Using Buckingham's  $\pi$  theorem show that the expression of force  $F = \rho L^2 V^2 \phi \left( \frac{\mu}{\rho V L}, \frac{Lg}{V^2} \right)$ . 10

b) Find the loss of head when a pipe of diameter 200 mm is suddenly enlarged to a diameter of 400 mm. The rate of flow of water through the pipe is 250 litres/s. http://www.makaut.com 5

11. a) An oil of specific gravity 0.9 and viscosity 0.06 Poise is flowing through a pipe of diameter 200 mm at the rate of 60 lit/s. Find the head loss due to friction for a 500 m length of pipe. Also compute the power lost due to friction. 10

b) Define water hammer in pipes and Cavitation in pumps. 5

12. , a) Write a short note on centrifugal pumps. 5
- b) Find the discharge through a rectangular channel of width 2 m, having a bed slope of 4 in 8000. The depth of flow is 1.5 m and take Manning's coefficient,  $N = 0.012$ . 5
- c) Write a short note on Hydraulic Ram. 5
- 

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**MAULANA ABUL KALAM AZAD UNIVERSITY OF  
TECHNOLOGY, WEST BENGAL**

**Paper Code : CE-403**

**SOIL MECHANICS**

*Time Allotted : 3 Hours*

*Full Marks : 70*

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own  
words as far as practicable.*

**GROUP - A**

**( Multiple Choice Type Questions )**

1. Choose the correct alternatives for any *ten* of the following : 10 × 1 = 10

i) A partially saturated sample of soil has a unit weight of  $2.0 \text{ g/cm}^3$  and specific gravity of soil particles is 2.6. If the moisture content in the soil is 20%, the degree of saturation is ?

a) 20%

b) 77%

c) 92%

d) none of these.



- vi) The part of water which is held under the influence of soil attractive forces is defined as
- a) Capillary water
  - b) Structural water
  - c) Adsorbed water
  - d) Ground water.
- vii) The clay mineral with largest swelling and shrinkage characteristics is <http://www.makaut.com>
- a) kaolinite
  - b) Illite
  - c) montmorillonite
  - d) none of these.
- viii) The soils that have been deposited from suspension in still, fresh water of lakes is known as
- a) Aeolian
  - b) Lacustrine
  - c) Alluvial
  - d) Glacial.
- ix) The co-efficient of permeability of a soil
- a) increases with decrease in temperature
  - b) increases with decrease in unit weight of water
  - c) increases with increase in temperature
  - d) decreases with an increase in void ratio.
- x) Silty clay is denoted by
- a) CM
  - b) MC
  - c) SM
  - d) MS.

- xi) When consolidation of saturated soil sample takes place, the degree of saturation
- a) Decreases
  - b) Increases
  - c) Remains constant
  - d) Decreases initially and then increases.
- xii) Both the shear stress and the normal stress on the plane of failure are measured directly in
- a) Triaxial shear test
  - b) Vane shear test
  - c) Direct shear test
  - d) Unconfined compressive test.

**GROUP - B**

**( Short Answer Type Questions )**

Answer any *three* of the following.  $3 \times 5 = 15$

2. What is Compaction and Consolidation ? What are the differences between these two ?  $2 + 3$
3. What do you understand by normally consolidated clay, over consolidated clay and Under consolidated clay ?

$1 + 2 + 2$

4. A falling head permeability test is conducted on a 100 mm long soil sample. The diameter of the stand pipe is  $1/10^{\text{th}}$  that of the specimen. The test took 900 seconds to fall from a height of 300 to 100 mm. Determine the coefficient of permeability of the specimen.
5. Calculate the stress in a soil mass 6m below the centre of a uniformly loaded circular area of radius 1.5m with a pressure of  $60\text{kN/m}^2$  and thus obtain the exact depth at which the stress reduced to 15% of the applied load.
6. a) What do you understand by quicksand condition ? 3
- b) Find out the value of critical hydraulic gradient for the soil, having its sp. Gravity equal to 2.68 and void ratio equal to 0.67. 2
7. A small cylinder having volume of  $500\text{ cm}^3$  is pressed into a recently compacted fill of embankment filling the cylinder. The mass of the soil in the cylinder is 1050 gm. The dry mass of the soil is 910 gm. Determine the void ratio and the saturation of the soil. Take the specific gravity of the soil grains as 2.7. 5

### GROUP - C

#### ( Long Answer Type Questions )

Answer any *three* of the following.  $3 \times 15 = 45$

8. a) State Stokes Law. What are the assumptions of Stokes Law ? 2 + 4

- b) The results of sieve analysis of a soil sample is given below. Draw the particle size distribution curve and state whether the soil is Well graded or poorly graded. 9

IS sieve (mm)	2.36	1.18	0.6	0.425	0.3	0.15	0.075	Pan
Mass retained (gm)	40	100	120	210	40	60	20	10

9. a) Derive Terzaghi's one dimensional consolidation theory and state the assumptions of the theory. 8

10 + 3

- b) What do you mean by single drainage and double drainage condition? <http://www.makaut.com> 2

10. a) Soil sample failed under a major principal stress of 300 kN/m<sup>2</sup> with a minor principal stress of 100 kN/m<sup>2</sup>. If for the same soil, minor principal stress is 250 kN/m<sup>2</sup>, find out the major principal stress for i)  $\Phi = 30^\circ$  and ii)  $\Phi = 10^\circ$ . 10

- b) Derive  $\sigma_1 = \sigma_3 N_\phi + 2C \sqrt{N_\phi}$ . 5

11. a) A clay layer of thickness 6m is settling by 20 cm after 1 year of time. After 1 years of time if the degree of consolidation is 40%, find out the time required for 27 cm settlement. Also find out the coefficient of consolidation. = ? 8

- b) The values of LL, PL and SL are measured by 40%, 30% and 25%. The volume at PL is 0.4 times of the volume at LL. If the volume at SL is 36 ml, find out the volume at LL. 7



12. a) What factors affect permeability of soils ?      3
- b) What will be the ratio of average permeability in horizontal direction to that in the vertical direction for a soil deposit consisting of three horizontal layers, if the thickness and permeability of the second layer are twice of those of the first and those of the third layer twice those of second ?

5 + 10



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**MAULANA ABUL KALAM AZAD UNIVERSITY OF  
TECHNOLOGY, WEST BENGAL**

**Paper Code : CE-402**

**STRUCTURAL ANALYSIS**

Time Allotted : 3 Hours

Full Marks : 70

*The figures in the margin indicate full marks.  
Candidates are required to give their answers in their own  
words as far as practicable.*

**GROUP - A**

**( Multiple Choice Type Questions )**

1. Choose the correct alternatives for any *ten* of the following : 10 × 1 = 10

i) In a beam where bending moment changes sign, the shear force will be

- |   |              |
|---|--------------|
| <input checked="" type="checkbox"/> a) zero | b) minimum   |
| c) maximum                                  | d) infinity. |

ii) The bending moment on a section is maximum where shear force is

- |                  |  |
|------------------|--|
| a) minimum       | <input checked="" type="checkbox"/> b) maximum |
| c) changing sign | d) zero.                                       |

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iii) The deflection at any point of a perfect frame can be obtained by applying a unit load in

- a) vertical direction
- b) the direction in which the deflection is required
- c) horizontal direction
- d) none of these.

iv) Influence line diagram is applicable for

- a) moving load
- b) dead load
- c) both (a) and (b)
- d) none of these.

v) Under a uniformly distributed load a cable takes the shape of a

- a) Parabola
- b) Circle
- c) Catenary
- d) Funicular polygon.

vi) The bending stress in a beam is ..... bending moment.

- a) equal to
- b) less than
- c) more than
- d) directly proportional to

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vii) The shear stress at the outermost fibres of a circular shaft under torsion is

- a) zero
- b) minimum
- c) maximum
- d) infinity.

viii) A beam of T-section is subjected to a bending moment of  $M$ . The maximum B.M. will occur at the

- a) top of the section
- b) bottom of the section
- c) neutral axis of the section
- d) junction of web and flange.

ix) In the moment-area method, the difference in slope between any two sections of a loaded member is equal to the

- a) area of the  $M/EI$  diagram between these two sections
- b) moment of the  $M/EI$  diagram between these two sections
- c) half of the area of the  $M/EI$  diagram between these two sections
- d) one third area of the  $M/EI$  diagram between these two sections.

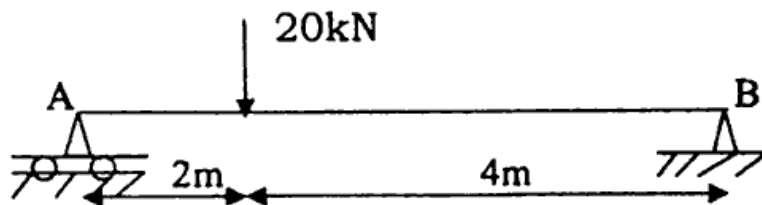
- x) Moment Distribution method is a/an
- a) Force Method
  - b) Elastic Method
  - c) Displacement Method
  - d) None of these.
- xi) A truss containing  $j$  joints and  $m$  members, will be a simple truss if
- a)  $m = 2j - 3$
  - b)  $j = 2m - 3$
  - c)  $m = 3j - 2$
  - d)  $j = 3m - 2$ .
- xii) The fixed support in a real beam becomes in a conjugate beam
- a) Roller
  - b) Hinged
  - c) Fixed
  - d) Free.

**GROUP - B**

**( Short Answer Type Questions )**

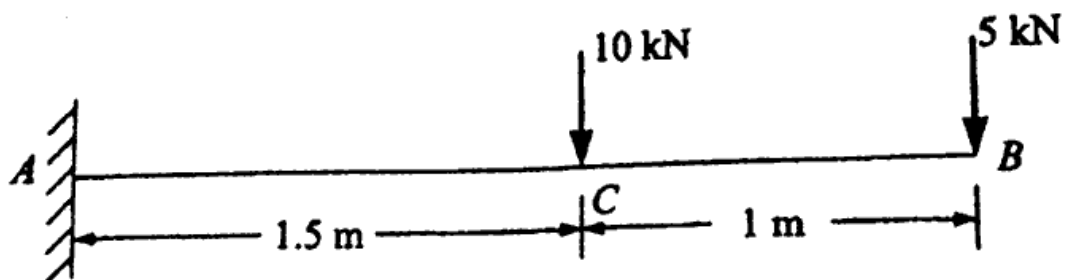
Answer any *three* of the following.  $3 \times 5 = 15$

2. A simply supported beam carries a point load of 20 kN as given in the figure below. Find out the deflection under the load and slopes at A and B by conjugate beam method. Take EI of the beam is constant.



3. Determine the slope and deflection at the free end of the given figure using moment area method.

Take  $EI = 4000 \text{ kN-m}^2$ .



4. Describe two theorems of Castigliano. Also find out the limitations of this theory.

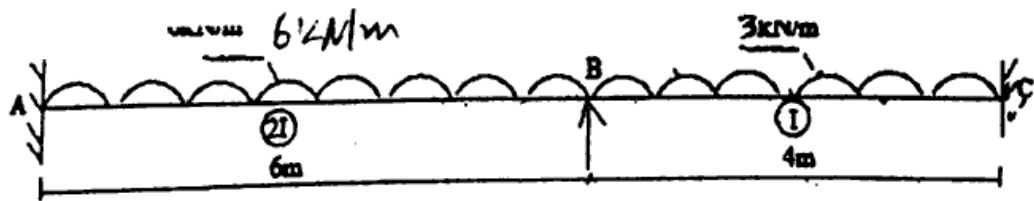
5. Define Static and Kinematic Indeterminacy with an example.
6. Differentiate between Portal method and Cantilever method in the analysis of lateral loads acting on the structure.

**GROUP - C**

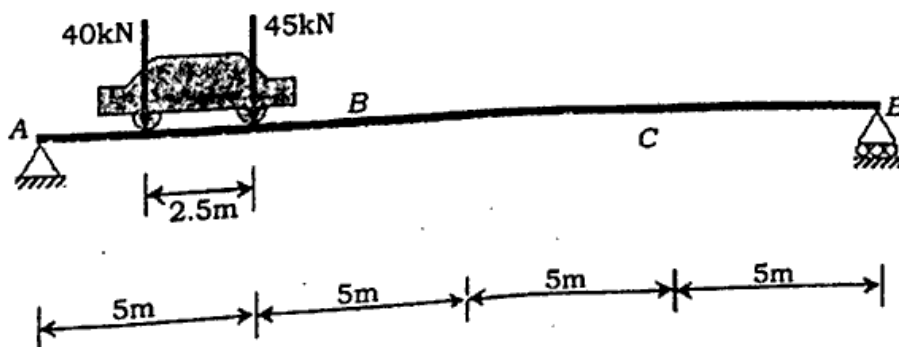
**( Long Answer Type Questions )**

Answer any *three* of the following.  $3 \times 15 = 45$

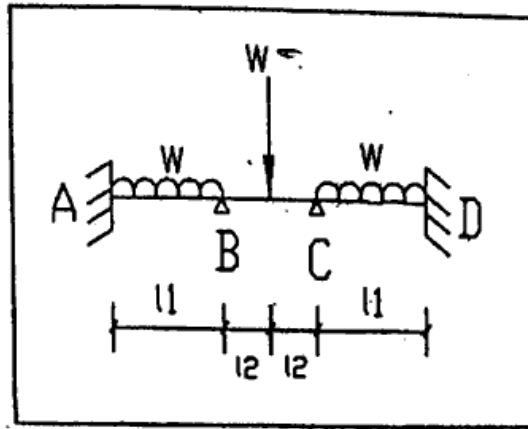
7. Analyze the continuous beam shown in figure, by moment distribution method. Assume  $E = 2 \times 10^5$  MPa and  $I = 8 \times 10^6$  mm<sup>4</sup> and draw Shear force and Bending moment diagram. <http://www.makaut.com>



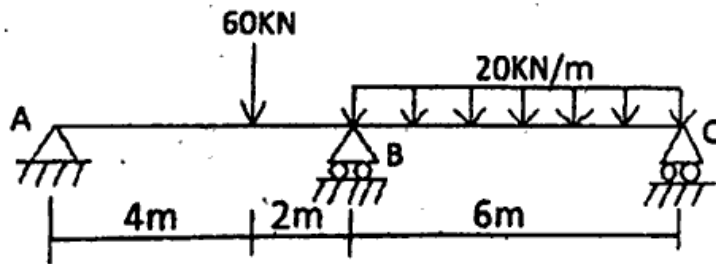
8. Find the maximum shear force at C for the moving load combination in the following figure :



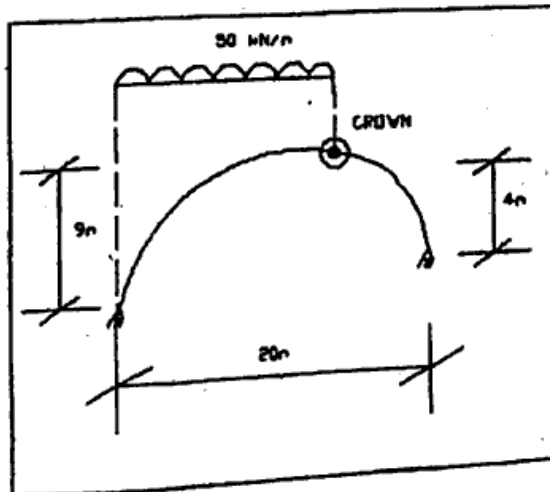
9. Draw bending moment and shear force diagrams by Slope Deflection Method for the following figure :



10. Analyze the beam by three moment theorem and draw BM and SF diagrams.



11. Determine the horizontal and vertical reactions at the supports of the three-hinged unsymmetrical parabolic arch shown below. Also find out the shear force, bending moment and normal thrust at a section at a horizontal distance of 4m from the left support.

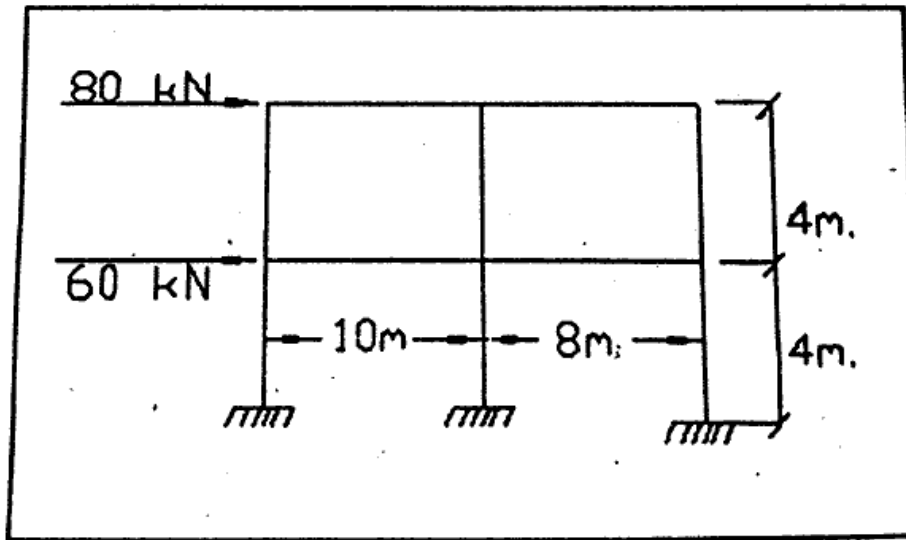


[ Turn over



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12. Analyse the following frame by cantilever method shown in figure. Draw the bending moment diagram.



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**MAULANA ABUL KALAM AZAD UNIVERSITY OF  
TECHNOLOGY, WEST BENGAL**

**Paper Code : EE-401**

**ELECTRICAL MACHINES – I**

*Time Allotted : 3 Hours*

*Full Marks : 70*

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own  
words as far as practicable.*

**GROUP – A**

**( Multiple Choice Type Questions )**

1. Choose the correct alternatives for any ten of the following : 10 × 1 = 10
- i) As compared to  $\Delta$ - $\Delta$  bank, the capacity of the V-V bank of the transformer is
- |          |           |
|----------|-----------|
| a) 57.7% | b) 56.6%  |
| c) 58.7% | d) 66.6%. |
- ii) If a 4 pole lap connected dc generator rotates at a speed of 1200 rpm, no of armature conductors is 80 with useful flux of 0.5 wb. The genreated emf will be :
- |         |                   |
|---------|-------------------|
| a) 780V | b) 805V           |
| c) 800V | d) none of these. |

- iii) The term cogging is associated with the following motor
- a) Dc series motor                      b) Induction motor  
c) Repulsion motor                      d) Dc shunt motor.
- iv) The magnetizing current in a transformer is rich in
- a) 3<sup>rd</sup> harmonic                      b) 5<sup>th</sup> harmonic  
c) 7<sup>th</sup> harmonic                      d) 9<sup>th</sup> harmonic.
- v) For a linear electromagnetic circuit, the following statement is true : <http://www.makaut.com>
- a) Field energy is equal to the co-energy  
b) Field energy is greater than the co-energy  
c) Field energy is less than the co-energy  
d) Co-energy is zero.
- vi) The emf induced in a conductor rotating in a bipolar field is
- a) ac    b) dc  
c) both ac and dc                      d) none of these.
- vii) For maximum starting torque of a three phase induction motor
- a)  $R_2 = X_2$                                       b)  $R_2 = 0.5X_2$   
c)  $R_2 = 2X_2$                                       d)  $R_2 = 0.4X_2$ .

viii) An 8 pole wound rotor induction motor operating at 60 Hz supply is driven at 1800rpm by a prime mover in the opposite direction of the revolving field. The rotor current frequency will be

- a) 60 Hz
- b) 120 Hz
- c) 180 Hz
- d) none of these.

ix) The speed of a dc motor can be increased by

- a) Increasing the armature current
- b) Decreasing the field current
- c) Decreasing the applied voltage
- d) Increasing the field current.

x) In an induction motor if the length of the airgap is increased

- a) Speed will reduce
- b) Efficiency will improve
- c) Power factor will be lowered
- d) Breakdown torque will be reduced.

xi) Scott connected transformers can convert

- a) 3 phase to 2 phase
- b) 2 phase to three phase
- c) both (a) and (b) above
- d) 3 phase to 4 phase.

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xii) Two transformers operating in parallel will share the load depending on their

- a) ratings
- b) leakage impedances
- c) efficiency
- d) per unit impedance.

xiii) In electromechanical energy conversion devices, a small air gap is left between rotor and the stator in order to

- a) reduce the reluctance of the air gap
- b) Increase the flux density in the air gap
- c) permit mechanical clearance
- d) avoid saturation of field.

**GROUP - B**

**( Short Answer Type Questions )**

Answer any *three* of the following.  $3 \times 5 = 15$

✓ 2. Prove that for open delta connection the capacity of the transformer bank is reduced by 42.3%.

✓ 3. Derive the emf equation for DC generator.

4. Draw and explain the torque speed characteristics of three phase induction motors.
- 5 Explain the various methods for reducing armature reaction of DC machines. <http://www.makaut.com>
6. Derive the electromechanical energy conversion model based on principle of energy conversion.

**GROUP - C**

**( Long Answer Type Questions )**

Answer any *three* of the following.  $3 \times 15 = 45$

7. a) A load of 1400 kVA at 0.866 lagging p.f is supplied by two three phase transformers of 1000 kVA and 500 kVA operating in parallel. The ratio of transformation is the same for both :

6600/400 delta star. If the equivalent secondary impedances are  $(0.001+j0.003)$  ohm and  $(0.0028+j0.005)$  ohm respectively, calculate the load and power factor of each.

- b) It is desired to transform 2400, 5000 kVA three phase power to two phase power by scott connected transformers. Determine the voltage and current ratings of both primary and secondary of each transformer. 8 + 7

8. a) Derive the torque equation of a DC motor?

- b) Draw and explain the open circuit characteristics and load characteristics for DC shunt generators. What is critical resistance ?

c) Draw the phasor diagram and the connection diagram for the following three phase transformer connections :

- ~~i) Dz6~~    ii) ~~Yy6~~    ~~iii) Dd6~~    iv) Dd0    v) Yy0

5 + (4 + 1) + 5

9. a) Draw the equivalent circuit of a three phase induction motor. Discuss the no load test and blocked rotor test for determining the equivalent circuit parameters.

b) What is slip ?

c) Prove that the maximum torque of a three phase induction motor is independent of rotor circuit resistance.

(2 + 5) + 2 + 6

10. a) Draw the phasor diagram and connection diagram for double star connection for converting three phase to six phase.

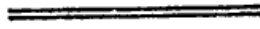
b) Draw and explain the torque-armature current characteristics and speed-armature current characteristics for DC series motors.

c) The power input to a 6 pole, 50 Hz, 3 phase induction motor is 700W at no load and 10 KW at full load. The no load copper losses may be assumed negligible while the full load stator and rotor copper losses are 295W and 310 W respectively. Find the full load speed, shaft torque and efficiency of the motor assuming rotational and core losses to be equal.

4 + (3 + 3) + 5

11. Write short notes on any *three* of the following : 3 × 5

- a) Star delta starting of three phase induction motors
- b) V-V connection of transformers
- c) Swinburne's test.
- d) Current transformer
- e) MMF distribution for a distributed winding.



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**MAULANA ABUL KALAM AZAD UNIVERSITY OF  
TECHNOLOGY, WEST BENGAL**

**Paper Code : HU-501**

**ECONOMICS FOR ENGINEERS**

*Time Allotted: 3 Hours*

*Full Marks: 70*

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words  
as far as practicable.*

**Group – A**

**(Multiple Choice Type Questions)**

1. Choose the correct alternative for *any ten* of the following:

1×10=10

(i) What is true about the relationship between AC and MC?

- (a) AC cuts MC from below
- (b) MC cuts AC from below
- (c) MC and AC do not cut each other
- (d) AC equals MC when AC is at its maximum

(ii) If Current Ratio is 2.2 and Current Liability is Rs. 80,000 then the amount of current asset will be

- (a) Rs. 1,76,000
- (b) Rs. 1,34,000
- (c) Rs. 1,60,000
- (d) Rs. 1,72,000

(iii) In replacement analysis old machines are known as

- (a) Defender
- (b) Challenger
- (c) Both (a) and (b)
- (d) None of these

(iv) At Break-even point

- (a) Total revenue = Total Cost
- (b) Total revenue = Total Fixed Cost
- (c) Total revenue = Total Variable Cost
- (d) All of the above

(v) Demand-pull inflation may be caused by

- (a) An increase in costs
- (b) A reduction in government spending
- (c) A reduction in interest rates
- (d) An outward shift in aggregate supply

(vi) Goodwill is a

- (a) Fixed asset
- (b) Current asset
- (c) Fictitious asset
- (d) Wasting asset

- (vii) A large angle of incidence indicates
- (a) A low rate of profit
  - (b) A high rate of profit
  - (c) No profit, no loss
  - (d) None of the above
- (viii) A card is drawn from a deck of 52 cards. Find the probability that it is either a red king or a black queen.
- (a)  $2/13$
  - (b)  $1/13$
  - (c)  $5/13$
  - (d)  $8/13$
- (ix) IRR stands for the rate of return for which
- (a)  $NPV = 0$
  - (b)  $NPV = 1$
  - (c)  $NPV = -1$
  - (d) NPV is maximum
- (x) The present value of ₹ 1 to be received after 3 years compounded annually at 10%
- (a) 0.909
  - (b) 0.826
  - (c) 0.751
  - (d) None of the above

(xi) A uniform series of payment occurring at equal interval of time is called \_\_\_\_\_.

- (a) Annuity
- (b) Amortization
- (c) Depreciation
- (d) Bond

(xii) The following value(s) of the Power-Sizing Exponent (E) indicates Economies of Scale

- (a)  $0 < E < 1$
- (b)  $E > 1$
- (c)  $E = 0$
- (d)  $E = 1$

### Group – B

(Short Answer Type Questions)

Answer *any three* of the following.

5×3=15

2. An asset purchased at Rs. 17,000 has a life time of 5 years and salvage value of Rs. 2,000. If depreciation is computed using straight line method, calculate the book value of the asset at the end of 3 years.
3. An aqueduct is needed to bring water into the city. It can be built at a reduced size now for Rs. 3 lakhs and enlarged 25 years later at Rs. 3.5 lakhs. The other option is to construct the full size aqueduct for Rs. 4 lakhs. Use Present Worth to find the better choice. [Given  $i = 6\%$ ].
4. A box contains 6 white and 4 black balls. Two balls are drawn at random one after another without replacement. Prepare the joint probability distribution table.

5. Discuss the economic problems faced by an engineer with suitable examples.
6. What is ratio analysis? Discuss any three ratios and point out their limitations, if any, for analysing the financial health of a company. 2+3=5

**Group – C**

(Long Answer Type Questions)

Answer any three of the following.

15×3=45

7. (a) What do you understand by replacement analysis? Explain 'Economic life' of an asset.
- (b) A firm has purchased an equipment at Rs. 20,000. When should the asset be replaced, if the following is given: (2+2)+11=15

End of year	Operation cost in (Rs.)	Maintenance cost in (Rs.)	Resale value in (Rs.)
1	2,000	200	10,000
2	3,000	300	9,000
3	4,000	400	8,000
4	5,000	500	7,000
5	6,000	600	6,000
6	7,000	700	5,000
7	8,000	800	4,000
8	9,000	900	3,000
9	10,000	1,000	2,000
10	11,000	1,100	1,000

8. ABC Toys Pvt. Ltd. is considering the addition of a new toy to its existing product line. Three alternative courses of action are available:

- (a) Work overtime to meet the demand of the new toy. Overtime expenses are estimated at Rs. 20,000 per month
- (b) Install new equipment for which fixed expenses per month are expected at Rs. 80,000
- (c) Lease (rent) a machine at the rate of Rs. 35,000 per month

Variable cost associated with the above three alternatives are Rs. 9, Rs. 7, Rs. 8 respectively. The price per unit of the toy, which is independent of the manufacturing alternative, is fixed at Rs. 15. The expected demand for the toy is given below:

10000 pieces with the probability of 0.5

20000 pieces with the probability of 0.3

50000 pieces with the probability of 0.2

Which alternative should the company adopt to manufacture the toy? Use decision tree.

9. (a) What are the causes of inflation?

(b) A company is planning to start an employee welfare fund. It needs Rs. 50,00,000 during the first year and it increases by Rs. 5,00,000 every year thereafter up to the end of the 5th year. The above figures are in terms of today's rupee value. The annual average rate of inflation is 6% for the next five years. The interest rate is 18%, compounded annually. Find the single deposit which will provide the required series of fund towards employee's welfare scheme after taking the inflation rate into account.

5+10=15

10. (a) Define Dual aspect concept in Financial Accounts.

- (b) The following is the Trial Balance of Durga Industries Ltd. as on 31st March, 2018 and other information. Prepare a Trading and Profit and Loss Account for the year ended 31st March, 2018 and a Balance Sheet as on 31st March, 2018.

Trial Balance of Durga Industries Ltd. as on 31st March, 2018

Dr			Cr
Particulars	Rs.	Particulars	Rs.
Investment	35,000	Share Capital	4,00,000
Calls on arrear	1,000	Sales	3,00,000
Land & Building	45,000	Sundry Creditors	17,000
Machinery	3,00,000	General Reserve	25,000
Furniture	15,000	Profit on consignment	13,000
Customs Duty	3,800	Loan from Bank	45,000
Wages	31,400	Dividend	3,000
Salaries	45,200		
Insurance	2,800		
Purchase	1,60,000		
Bills Receivable	21,200		
General Expenses	6,900		
Sundry Debtor	60,000		
Opening Inventory	65,000		
Cash at Bank	8,800		
Cash in hand	900		
Director's fees	1,000		
	8,03,000		8,03,000

The following further information is to be taken into consideration:

- (i) Closing Inventory Rs. 86,000
- (ii) Depreciate Machinery at 10%
- (iii) Outstanding Salary Rs. 4,000
- (iv) Transfer Rs. 5,000 to General Reserve
- (v) The authorized capital of the company is Rs. 6,00,000 divided into Equity Shares of Rs. 10 each
- (vi) Provision for income tax @ 30%

3+12=15

11. Write short notes on *any three* of the following:

- (a) Importance of Break Even analysis
- (b) Difference between NPV and IRR
- (c) Use of price indexes in engineering economic analysis
- (d) Benefit cost ratio
- (e) Types of Inflation

5×3=15



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**MAULANA ABUL KALAM AZAD UNIVERSITY OF  
TECHNOLOGY, WEST BENGAL**

Paper Code : CE-703C

PUID : 07227 (To be mentioned in the main answer script)  
**ADVANCED HIGHWAY AND TRANSPORTATION  
ENGINEERING**

Time Allotted : 3 Hours

Full Marks : 70

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own  
words as far as practicable.*

**GROUP - A**

**( Multiple Choice Type Questions )**

1. Choose the correct alternatives for any ten of the following : 10 × 1 = 10
- i) The basic objective of traffic engineering is to achieve
- a) ~~Efficient, free and rapid flow of traffic with least priority given to accidents~~
  - b) Efficient, free and rapid flow of traffic with fewer accidents
  - c) Efficient and rapid flow of traffic
  - d) Rapid flow of traffic.

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- ii) When the width of car parking space and width of street are limited, generally preferred parking system is
- a) Parallel Parking
  - ~~b) 45 degree parking~~
  - c) 65 degree parking
  - d) 90 degree parking.
- iii) Speed regulations on roads is decided on the basis of
- a) 60 percentile cumulative frequency
  - b) 75 percentile cumulative frequency
  - ~~c) 80 percentile cumulative frequency~~
  - d) 95 percentile cumulative frequency.
- iv) Which one is not a public transport mode
- a) MRTS
  - b) BRTS
  - ~~c) LRTS~~
  - d) CAR.
- v) The first stage in the function of traffic engineering department is
- a) Planning and design
  - b) Collection of data
  - ~~c) Investigations~~
  - d) Finance.
- vi) The rial is designated by its
- ~~a) Length~~
  - b) Weight
  - c) Cross-section
  - d) Weight per unit length.

- vii) Creep is the
- ~~a)~~ Longitudinal movement of rail
  - b) Lateral movement of rail
  - c) Vertical movement of rail
  - d) Difference in level of two rails.
- viii) Maximum degree of curvature for MG rail is limited to
- a) 10 degree
  - b) 16 degree
  - c) 30 degree
  - ~~d)~~ 26 degree.
- ix) The maximum number of vehicles can be parked with
- a) Parallel parking
  - ~~b)~~ right angle parking
  - c) 45° angle parking
  - d) 75° angle parking.
- x) The colour of light used for visibility during fog is
- ~~a)~~ Red
  - b) Yellow
  - c) Green
  - d) White.
- xi) The most efficient traffic signal system is
- a) Simultaneous system
  - b) alternate system
  - ~~c)~~ flexible progressive system
  - d) simple progressive system.
- xii) A complete signal-time cycle constitutes
- a) red timing
  - b) yellow timing
  - c) green timing
  - ~~d)~~ all of these.

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**GROUP - B**

**( Short Answer Type Questions )**

Answer any *three* of the following.  $3 \times 5 = 15$

2. What are the human factors and driver characteristics in traffic engineering ? Discuss.  $2 + 3$
3. Classify airports based on ICAO and FAA.  $5$
4. a) Draw the schematic of planning process showing the various stages of transportation planning.  
b) How the land-use and transportation demand are related to each other ?  $4 + 1$
5. a) What are the different surveys are conducted to fix a best possible alignment in a railway project ?  
b) What is superelevation ? What are the limits of superelevation in Indian railway system ?  $1 + 4$
6. a) What is Apron ? What are the parameters are considered while design the size of the Apron ?  
b) Discuss the factors which control the Taxiway Layout.  $2 + 3$

**GROUP - C**

**( Long Answer Type Questions )**

Answer any *three* of the following.  $3 \times 15 = 45$

7. a) Discuss the regulatory traffic signs with sketch.  
b) Write the advantages and disadvantages of Traffic Signals ?

- c) The average normal flow of traffic on cross roads A and B during design period are 400 and 250 pcu per hour; the saturation flow values on these roads are estimated as 1250 and 1000 pcu per hour respectively. The all-red time required for pedestrian crossing is 12 sec. design two phase traffic signal by Webster's method with phase diagram. 4 + 3 + 8
8. a) What are the design factors of a Rotary Intersection ?
- b) Consider the following six-zone model of a town. Zones 1, 2 and 3 are fully residential areas and Zones 4, 5 and 6 are fully shopping areas. The shopping areas, the shopping trip attracted (per day), the shopping trips produced (per day), and the travel distances are shown in Table 1. The cells which have a "-" imply that those data are irrelevant to the problem. Determine the trip distribution between the zones for the following different scenario : 5 + 10

Table 1

Zone	Shop area (m <sup>2</sup> )	Trips Produced	Trips attracted	Distance (km) to					
1	-	1000	-	-	-	-	4	2	7
2	-	2000	-	-	-	-	3	1	6
3	-	3000	-	-	-	-	5	2	6
4	1000	-	800	4	3	5	-	-	-
5	2000	-	1200	2	1	2	-	-	-
6	3000	-	1200	7	6	6	-	-	-

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- i) Use origin-Constrained gravity model assuming  $f(a)$  to be linear function of the shopping area (in square meter) with a slope of 0.01 and constant term of 10. Also assume  $(d_{ij})$  to be  $d_{ij}^2$  where  $d_{ij}$  is the distance in KM.
- ii) Use the origin-destination constrained gravity model with the same relevant assumptions as those in (i). <http://www.makaut.com>
9. a) A taxiway is to be designed for operating Boeing 70-320 which has the following characteristics. Determine the turning radius of the taxiway.
- |   |         |
|---|---------|
| Wheel base  | 17.70 m |
| Tread of main loading gear                                | 6.62 m  |
| Turning speed   | 40 kmph |
| Coefficient of friction between tire and pavement surface | 0.13    |
- b) What are the surveys required for Airport site selection ?
- c) Discuss briefly the Wind Rose. 5 + 5 + 5
10. a) What are the primary requirements of a Railway Station ?
- b) Write short note on Hump Yards and Locomotive Yards.
- c) What are the classifications and types of signals in railway engineering ? 5 + 5 + 5

11. a) If a  $8^\circ$  curve track diverges from a main track of  $5^\circ$  in an opposite direction in the layout of a B.G track, calculate superelevation and speed on the branch line, if the maximum speed permitted on the main line is 45 kmph. 5
- b) Classify rail sleepers. What are the necessities points and crossings in rails. 3 + 2
- c) Explain coning of wheels with neat diagram. What is corrugation in rails ? Suggest remedial measure for corrugation. 2 + 2 + 1
- 

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**MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL**

Paper Code : CE-701

PUID : 07221 (To be mentioned in the main answer script)

**ENVIRONMENTAL ENGINEERING**

Time Allotted : 3 Hours

Full Marks : 70

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words as far as practicable.*

**GROUP - A**

**( Multiple Choice Type Questions )**

1. Choose the correct alternatives for any ten of the following : 10 × 1 = 10

- i) Sewage treatment plants are normally designed for a design period of
  - a) 40-50 years
  - ~~b) 30-40 years~~
  - c) 15-20 years
  - d) 5-10 years.

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- ii) When fluoride concentration in exceeds 1.5mg/l or so, the disease that may caused is
  - a) Methemoglobinemia
  - ~~b) Fluorosis~~
  - c) Dental caries in children
  - d) Poliomyelitis.
- iii) Expression for settling velocity for a sedimentation tank is given by :
  - a)  $Q/BH$
  - ~~b)  $Q/BL$~~
  - c)  $Q/LH$
  - d) none of these.
- iv) A manhole is generally classified as a deep manhole, if its depth is less than
  - a) 0.9 m
  - b) 1.2m
  - c) 1.5m
  - ~~d) 2 m.~~
- v) The total water requirement of a city is generally assessed on the basis of
  - a) Maximum hourly demand
  - b) Maximum daily demand+ fire demand
  - c) Average daily demand + fire demand
  - ~~d) Greater of (a) and (b).~~
- vi) Water sample has pH value of 9.00. The concentration of OH ion in the water sample is
  - a)  $10^{-9}$  moles/L
  - ~~b)  $10^{-5}$  moles/L~~
  - c) 0.17 mg/L
  - d) 1.7 mg/L.

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vii) As per IS- 10500:2012, the safe permissible limit of Arsenic in potable water is

- a) 0.01mg/L
- ~~b) 0.05mg/L~~
- c) 10mg/L
- d) both of (a) and (c).

viii) Criterion for particles to be removed completely in a sedimentation tank is given by :

- ~~a)  $v_s \geq Q/BL$~~
- b)  $v_s < Q/BL$
- c)  $v_s > Q/LH$
- d) none of these.

ix) The flow velocity in a sewer does not depend on :

- a) its grade
- ~~b) its length~~
- c) its hydraulic mean depth
- d) its roughness.

x) The nitrogenous demand begins after how many days ?

- a) 3
- b) 4
- ~~c) 5~~
- d) 10.

xi) Distribution mains of any water supply, is normally designed for its average daily requirement

- a) 100%
- ~~b) 150%~~
- c) 200%
- d) 225%.

xii) The efficiency of sedimentation tank does not depend upon

- a) detention time
- b) depth of the tank
- ~~c) length of the tank~~
- d) horizontal velocity of water.

**GROUP - B**

**( Short Answer Type Questions )**

Answer any three of the following. 3 × 5 = 15

2. Explain what you mean by Self-cleansing velocity and Non-scouring velocity for a sewer pipe.
3. Find the terminal velocity (up to trial two) of a spherical particle with diameter 0.5mm and specific gravity of 2.65 settling through water at 20°C. Assume  $\omega = 998.2\text{kg/m}^3$  and  $\mu = 1.002 \times 10^{-3}\text{N-s/m}^2$  at 20°C.
4. A 60 cm diameter well is being pumped at a rate of 1450 litres/minute. Measurement in a nearby test well were made at the same time as follows. At a distance of 6 m from the well being pumped, the drawdown was 7 m, and at 15 m, the drawdown was 2.5 m. The bottom of the well is 100 m below the ground water table.

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- a) Find out the coefficient of permeability.
  - b) If all the observed pts. were on the Dupuit curve, what was the drawdown in the well during pumping ?
  - c) What is the sp. capacity of the well ?
  - d) What is the maximum rate at which water can be drawn from this well ?
5. If 20 ml of raw sewage has been diluted to 500 ml and DOi of the diluted sample was 15 mg/l, and it was 10 mg/l after 5 days incubation at 20°C, then find the COD of the raw sewage with respect to its BOD<sup>5</sup>.

For a city, population 5 lacs, find the following in connection with the water supply

- a) Average daily demand
- b) Max daily demand
- c) Peak demand
- d) Fire demand.

Assume avg. water consumption 230 lpcd.

**GROUP - C**

( Long Answer Type Questions )

Answer any *three* of the following.  $3 \times 15 = 45$

7. A city with a population of 1 crore has to be supplied with water at 250 litres per person per day. The probable hourly variation in the rate of demand is given in the given table :

Period of day in hours (1)	Percentage of average hourly flow expected (2)
0-1	22.5
1-2	22.5
2-3	22.5
3-4	30
4-5	37.5
5-6	60
6-7	120
7-8	180
8-9	270
9-10	330
10-11	330
11-12	225
12-13 <i>12-1</i>	150
13-14 <i>1-2</i>	120
14-15 <i>2-3</i>	90
15-16 <i>3-4</i>	165
16-17 <i>4-5</i>	225
17-18 <i>5-6</i>	270
18-19 <i>6-7</i>	270
19-20 <i>7-8</i>	240
20-21 <i>8-9</i>	210
21-22 <i>9-10</i>	120
22-23 <i>10-11</i>	67.5
23-24 <i>11-12</i>	22.5

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Determine the capacity of the balancing reservoir to be provided for balancing the variable demand against a constant rate of pumping,

- a) if the pumping is to be done for all the 24 hours.
- b) if the pumping is to be done only from 5 A.M. to 11 A.M. and 2 P.M. to 8 P.M. Also mention the rate of pumping required in both cases. Solve this problem by using, (i) mass curve method, (ii) analytical method.

8. a) State the design parameters considered to design a aeration tank for an activated sludge process.
- b) An average operating data for conventional activated sludge treatment plant is given below :

- i) waste water flow = 50000 m<sup>3</sup>/d
- ii) volume of aeration tank = 15500 m<sup>3</sup>
- iii) influent and effluent BOD are 200mg/l and 25 mg/l respectively
- iv) mix liquor suspended solid (MLSS) = 3000 mg/l
- v) effluent suspended solids = 40 mg/l
- vi) waste sludge suspended solids = 12000 mg/l
- vii) quantity of waste sludge = 250 m<sup>3</sup>/d.

Based on the above determine :

- i) aeration period (hrs)
- ii) food to microorganism ratio ( kg BOD per day/ kg MLSS
- iii) percentage efficiency of BOD removal
- iv) sludge age in days.

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9. a) What is meant by coagulation? What are the common coagulants used? Describe the chemical reactions involved and indicate the formulas (or equations) for chemical reactions the flocs that form. Explain the reactions by stages if any.

b) A coagulation-sedimentation plant clarifies 50 million liters of water every day. The quantity of filter alum required at the plant is 20 mg/litre. If the raw water is having alkalinity equivalent to 5 mg/litre of CaCO<sub>3</sub>. Determine the quantity of filter alum and the quick lime (containing 85% of CaO) required per year by the plant. Given the molecular weight as [Al = 27, S = 32, O = 16, H = 1, Ca = 40, C = 12] (1 + 1 + 5 + 2) + 6

10. a) State the conventional flow chart of a sewage treatment plant for treating municipal sewage showing all the details.

b) Design a grit chamber for a maximum waste water flow of 8000 m<sup>3</sup>/d to remove particles upto 0.2mm dia having specific gravity of 2.65. Settling velocities of these particles range from 0.018 to 0.022 m/sec. Maintain a constant flow through velocity of 0.3 m/sec using a proportional flow weir.

11. Write short notes on any three of the following : 3 x 5

- a) Activated Sludge Process
- b) Dead End System
- c) Oxidation Ditch
- d) Break Point Chlorination
- e) Grit Chamber.

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**MAULANA ABUL KALAM AZAD UNIVERSITY OF  
TECHNOLOGY, WEST BENGAL**

Paper Code : CE-702

PUID : 07224 ( To be mentioned in the main answer script )

**WATER RESOURCE ENGINEERING**

Time Allotted : 3 Hours

Full Marks : 70

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words as far as practicable.*

**GROUP - A**

**( Multiple Choice Type Questions )**

1. Choose the correct alternatives for any *ten* of the following : 10 × 1 = 10
- i) The process of losing water from the leaves of plants, is termed as
- a) Surface evaporation
  - b) Water surface evaporation
  - ~~c) Transpiration~~
  - d) Precipitation.
- ii) The maximum depth in soil strata, in which the crop spreads its root system, and derives water from the soil, is called
- a) kor depth
  - ~~b) root zone depth~~
  - c) delta
  - d) overlap allowance.

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- iii) The commonly used rain gauge is
- a) weighing bucket type
  - ~~b) tipping bucket type~~
  - c) float type
  - d) none of these.
- iv) Cyclonic precipitation results from
- a) lifting of air masses converging into low pressure area <http://www.makaut.com>
  - ~~b) natural rising of warmer, lighter air in colder and denser surroundings~~
  - c) lifting of warm moisture-laden air masses due to topographic barriers
  - d) All of these.
- v) The duty of a crop is 432 hectares per cumec when the base period of the crop is 100 days. The delta for the crop will be
- a) 100
  - ~~b) 200~~
  - c) 432
  - d) 864.
- vi) Lacey's Regime theory is not applicable to a canal in
- ~~a) true regime~~
  - b) initial regime
  - c) final regime
  - d) none of these.

vii) The volume of rainfall which produces equal run-off, is called

- a) Point rainfall      ~~b) Effective rainfall~~  
c) Average rainfall      d) Ground rainfall.

viii) Critical velocity ratio for use in Kennedy's theory is

- a)  $< 1$       b)  $> 1$   
c) equal to 1      ~~d) All of these.~~

ix) Specific yield for an unconfined aquifer is

- a)  $>$  porosity  
~~b)  $<$  porosity~~  
c) equal to porosity  
d) unrelated to porosity.

x) Darcy's law is valid when the flow is

- ~~a) Laminar~~  
b) Turbulent  
c) Both (a) and (b)  
d) None of these.

xi) A graph showing variations of discharge with time, at a particular point of a stream is known as

a) mass inflow curve      b) logistic curve

c) hydrograph              d) none of these.

**GROUP - B**

**( Short Answer Type Questions )**

Answer any *three* of the following.       $3 \times 5 = 15$

2. A catchment area has seven rain-gauge stations. In a year the annual rainfalls recorded by the gauges are as follows :

Station	P	Q	R	S	T	U	V
Rainfall (cm)	130.00	142.10	118.20	108.50	165.20	102.10	149.60

For a 5% error in the estimation of the mean rainfall, calculate the minimum number of additional stations required to be established in the catchments.

3. What meant by duty and delta ? Derive the relation between duty and delta for a given base period.

4. The normal annual rainfalls at stations A, B, C and D in a basin are 80.97, 67.59, 76.28, 92.01 cm respectively. In the year 1985, the station D was inoperative and the stations A, B and C recorded annual precipitation of 91.11, 72.23 and 79.89 cm respectively. Estimate the rainfall at station D in that year.

PR RP.

- 5/ Differentiate between Lacey's Theory and Kennedy's Theory.
- 6/ a) What is meant by regime? Differentiate between regime in natural rivers and in artificial channel.
- b) What is a canal head regulator?

**GROUP - C**

**( Long Answer Type Questions )**

Answer any three of the following.  $3 \times 15 = 45$

7. a) Design an unlined irrigation channel with the following data :
- Discharge of the canal = 24 cumecs
- Permissible mean velocity = 0.80 m/sec.
- Bed slope = 1 in 5000
- Side slope = 1:1
- Chezy's constant,  $C = 44$ .
- b) Design by Lacey's method a suitable canal section for irrigation to carry a maximum discharge of 82.5 cumecs flowing through fine alluvium. Manning's roughness is 0.02 and the mean country slope is 0.15 per thousand. Assume the canal to be in cutting having a side slope of 1 ( H ) : 1 ( V ). Take  $f = 1.20$  for the given material. 5 + 10



8. a) After how many days will you supply water to soil in order to ensure sufficient irrigation of the given crop, if —
- (i) Field Capacity of the soil = 28%
  - (ii) Permanent Wilting Point = 13%
  - (iii) Dry density of soil = 1.3 gm/c.c.
  - (iv) Effective depth of root zone = 70 cm
  - (v) Daily consumptive use of water for the given crop = 12 mm. <http://www.makaut.com>

Assume any other data, not given.

- b) The gross commanded area for a distributary is 6000 hectares, 80% of which is culturable irrigable. The intensity of irrigation for Rabi season is 50% and that for Kharif season is 25%. If the average duty at the head of the distributary is 2000 hectares/cumec for Rabi season and 900 hectares/cumec for Kharif seasons.. find out the discharge required at the head of the distributary from average demand considerations.

8 + 7

9. a) (i) What is S-curve and what is its significance ?  
(ii) What is flood routing ?

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- 6) The ordinates of a 4-hr unit hydrograph for a particular basin are given below. Derive the ordinates of (i) the S-curve hydrograph and (ii) the 2-hr unit hydrograph, where area of the basin is 630 sq.km.

Time (hr)	0	2	4	6	8	10	12	14	16
Discharge (cumec)	0	25	100	160	190	170	110	70	30

(3 + 2) + 10

10. Design an irrigation channel to carry 6 cumecs of discharge, the critical velocity ratio ( $m$ ) is 1.0, rugosity coefficient ( $n$ ) is 0.0225, and bed slope of the channel is 1 in 5000. Use Kennedy's method.

Assume other reasonable data for the design.

11. a) State the various methods for computing run-off depth in a basin.
- b) The followings are the rates of rainfall for successive 20 mins period of a 140 mins storm 2.5, 2.5, 10.0, 7.5, 1.25, 1.25 and 5 cm/hr. Taking the value of  $\phi_{index} = 3.2$  cm/hr. Find out the (i) net runoff in cm (ii) total rainfall and (iii) the value of  $W_{index}$ .

5 + 10

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**MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL**

Paper Code : CS-603

**OPERATING SYSTEM**

Time Allotted : 3 Hours

Full Marks : 70

*The figures in the margin indicate full marks.  
Candidates are required to give their answers in their own words as far as practicable.*

**GROUP - A**

**( Multiple Choice Type Questions )**

1. Choose the correct alternatives for any *ten* of the following : 10 × 1 = 10

i) A computer system has 9 tape drives, with  $n$  processes competing for them. Each process may need 3 tape drives. The maximum value of  $n$  for which the system is guaranteed to be deadlock free is

- |      |       |
|------|-------|
| a) 9 | b) 7  |
| c) 8 | d) 6. |

ii) The average wait time for five processes P1-P5 with burst of 5, 19, 2, 16 and 7 milliseconds respectively, using SJF is

- |          |             |
|----------|-------------|
| a) 5 ms  | b) 9.8 ms   |
| c) 28 ms | d) 10.6 ms. |

[ Turn over

- iii) A situation where several processes access and manipulate the same data concurrently and the outcome of the execution depends on the particular order in which access takes place is called
- a) race condition
  - b) data inconsistency
  - c) starvation
  - d) fatal error.
- iv) What are very effective because a mode switch is not required to switch from one thread to another ?
- a) Kernel-level threads
  - b) Alterable threads
  - c) User-level threads
  - d) Application level threads.
- v) The default remedy of starvation is
- a) Ageing
  - b) Critical section
  - c) Mutual exclusion
  - d) All of these.
- vi) Which of the following page replacement algorithms suffers from Belady's anomaly ?
- a) Optimal replacement
  - b) LRU
  - c) FIFO
  - d) Both (a) and (c).
- vii) Which of the following is false ?
- a) Segmentation suffers from external fragmentation
  - b) Paging suffers from internal fragmentation
  - c) Virtual memory is used only in multi-user system
  - d) Segmented memory can be paged.
- viii) If a process has 32 k bytes logical address space and the page size is 2048 bytes then the number of frames of that process is
- a) 4
  - b) 16
  - c) 8
  - d) 32.

ix) In DMA transfer

- a) CPU is involved actively during data transfer
- b) CPU is involved partially during data transfer
- c) DMA controller is actively involved during data transfer
- d) Both (b) and (c).

x) Page stealing is

- a) a sign of efficient system
- b) taking larger disk space's for pages paged out
- c) taking page frames from other working sets
- d) one of the tuning goals.

xi) Scheduling a process from Ready Queue to CPU is done by

- a) Short term scheduler
- b) Middle term scheduler
- c) Long term scheduler
- d) Dispatcher.

xii) Which scheduling policy is most suitable for the time-sharing operating system ?

- a) Shortest job first
- b) Round Robin
- c) First come first serve
- d) Multilevel queue.

Turn over

**GROUP - B**

**( Short Answer Type Questions )**

Answer any *three* of the following  $3 \times 5 = 15$

2. Prove that linear ordering for denying the "circular wait" condition actually prevents circuits from developing in resource allocation graphs. How can context switch time be reduced ? 3 + 2
3. What is fragmentation ? Explain different types of fragmentation. <http://www.makaut.com> 1 + 4
4. How to implement a solution to the Readers-Writers Problem with the use of semaphores ?
5. Suppose a disk drive has 300 cylinders, numbered 0 to 299. The current head position of the disk is at 90. The queue of pending requests, in FIFO order is  
36, 79, 15, 120, 199, 270, 89, 170  
Calculate the average cylinder movements for the following algorithms :
  - i) SSTF
  - ii) C-SCAN
  - iii) SCAN
6. What is Bounded Buffer Problem ? Explain with the solution.
7. What are the advantages and disadvantages of Paging and Segmentation ? What is the difference between a page and a frame ?

**GROUP - C**

**( Long Answer Type Questions )**

Answer any *three* of the following.  $3 \times 15 = 45$

8. a) Explain CPU scheduling criteria.
- b) Explain the different states of a process using state transition diagram.
- c) What are the main reasons to use of Thread rather than process for different applications ?
- d) Consider the following set of processes :

Process	CPU Burst Time	Priority	Arrival time
P0	80	3	0
P1	20	1	10
P2	10	3	10
P3	20	4	80
P4	50	2	85

Draw the Gantt chart using RR ( $t_s = 15$ ) and preemptive priority scheduling. Calculate average waiting time and total Turnaround time.

$$2 + 3 + 3 + 7$$

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9. a) Explain what is Indexed Allocation of file space on disk. What are the advantages and disadvantages of contiguous allocation ?
- b) Write down the merits and demerits of a virtual memory system.
- c) Explain Belady's anomaly.
- d) Compare best fit and first fit algorithm for memory allocation.

4 + 4 + 2 + 5

10. a) "All unsafe states may not lead to deadlock". - Why or why not ?
- b) Explain Critical-section problem. How semaphore can be used to solve it ?
- c) Consider the following snapshot of a system :

Process	Allocation ABCD	Max ABCD	Available ABCD
P0	0012	0012	1520
P1	1000	1750	
P2	1354	2356	
P3	0632	0652	
P4	0014	0656	

Answer the following questions using the Banker's algorithm :

- i) What is the content of the matrix need ?
- ii) Is the system in a safe state ? Justify.



iii) If a request from process P1 arrives for (0, 4, 2, 0) can the request be granted immediately? Answer with justification.

3 + 4 + 8

11. a) What are the advantages of segmentation over paging?

b) Explain the difference between Internal and External fragmentation. Which one occurs in paging system? How the problem of external fragmentation be solved?

c) What is thrashing?

d) Consider the following sequence of memory references generated by a single program in a pure paging system :

10, 11, 104, 104, 170, 173, 177, 309, 245, 246, 247, 458, 364.

Determine the number of page faults for each of the following page replacement policies assuming 3 (three) page frames are available and all are initially empty.

The size of a page is 100 words :

i) LRU

ii) FIFO

iii) Optimal page replacement. 2 + 4 + 2 + 7

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12. Write short notes on any *three* of the following :  $3 \times 5$

- a) Data transfer method of I/O devices.
  - b) Process Control Block (PCB)
  - ~~c) Preemptive SJF scheduling~~
  - ~~d) Starvation~~
  - ~~e) Kernel-Level Thread and User-Level Thread~~
  - f) Security and Protection.
- 

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**MAULANA ABUL KALAM AZAD UNIVERSITY OF  
TECHNOLOGY, WEST BENGAL**

**Paper Code : CS-703C**

**ARTIFICIAL INTELLIGENCE**

**Time Allotted: 3 Hours**

<http://www.makaut.com>

**Full Marks: 70**

*The figures in the margin indicate full marks.  
Candidates are required to give their answers in their own words  
as far as practicable.*

*Answer all groups.*

**Group – A**

**(Multiple Choice Type Questions)**

**1×10=10**

**1. Choose the correct alternative of the following:**

- (i) Frame is a collection of
- |                 |                |
|-----------------|----------------|
| (a) Slots       | (b) Fillers    |
| (c) Resolutions | (d) Knowledges |
- (ii) A Bayesian network is a
- |                      |                    |
|----------------------|--------------------|
| (a) tree             | (b) directed graph |
| (c) undirected graph | (d) None of these  |
- (iii) Horn clause is a clause with \_\_\_\_\_ positive literals.
- |                  |                  |
|------------------|------------------|
| (a) at most one  | (b) at most two  |
| (c) at least one | (d) at most four |
- (iv) An algorithm that gives optimal solution is <http://www.makaut.com>
- |                   |         |
|-------------------|---------|
| (a) Hill climbing | (b) BFS |
| (c) Blind search  | (d) A*  |
- (v) Uniformed search is also known as:
- |                        |                          |
|------------------------|--------------------------|
| (a) Brute force search | (b) Hill climbing search |
| (c) Worst case search  | (d) Blind search         |

- (vi) The process of eliminating existential quantifiers is known as
- (a) Resolution
  - (b) Skolemisation
  - (c) Unification
  - (d) None of these
- (vii) The rule used to change weight in Neural Network (NN) is
- (a) Kirchoff's rule
  - (b) Hebb's rule
  - (c) Boehm's rule
  - (d) None of these
- (viii) Inheritable knowledge is best represented by: <http://www.makaut.com>
- (a) Semantic net
  - (b) FOPL
  - (c) Database
  - (d) None of these
- (ix) Minimax algorithm search process obeys
- (a) breadth first search fashion.
  - (b) depth first search fashion.
  - (c) best first search fashion.
  - (d) blind search fashion.
- (x) Depth first search procedure uses
- (a) AND graph
  - (b) OR graph
  - (c) AND-OR graph
  - (d) None of these

**Group – B**

**(Short Answer Type Questions)**

Answer any three of the following.

5×3=15

2. Compare and contrast Best First and Hill climbing search. 5
3. What is an agent in AI? What are the types of agent? Discuss about environment for agent. 1+2+2=5
4. What is bling search technique? Explain with examples. <http://www.makaut.com> 5
5. What is tautology? Prove that  $((P \rightarrow Q) \rightarrow P) \rightarrow P$  is a tautology. What are Modus Ponens and Modus Tollens? 1+2+2=5
6. Write iterative deepening algorithm with example. 5

**Group – C**  
**(Long Answer Type Questions)**  
**Answer any three of the following.**

15×3=45

7. Suppose you have the following search space:

State	Next	Cost
A	B	4
A	C	1
B	D	3
B	E	8
C	C	0
C	D	2
C	F	6
D	C	2
D	E	4
E	G	2
F	G	8

Assume that the initial state is A and the goal state is G. Show how each of the following search strategies would create a search tree to find a path from the initial state to the goal state and the cost of the solution:

(i) Breadth-first search <http://www.makaut.com>

(ii) Depth-first search

(iii) Iterative deepening search

5+5+5=15

8. (a) What do you mean by constraint satisfaction problem? Solve the following cryptology problem using constraint satisfaction search:

SEND  
 MORE  
 -----  
 MONEY

(b) Write a program in PROLOG to compute the GCD of two numbers.

10+5=15

9. (a) What is 'Horn Clause'? <http://www.makaut.com>

(b) What is Skolemisation?

(c) Given the following text 'Everyone who enters in a theatre has to buy a ticket. Person who doesn't have money can't buy a ticket. Vinod enters a theatre'. Prove by resolution that 'Vinod has money'.

(d) With the help of semantic net, prove that Sourav is 6 feet tall and he is taller than Sachin. 2+3+5+5=15

10. (a) Briefly explain the steps of Natural Language Processing  
(b) Generate the parse tree for the sentence 'The boy went to School'. 3+5+7=15  
(c) Explain AO\* algorithm with a suitable example. 5x3=15
11. Write short notes on *any three* of the following: <http://www.makaut.com>  
(a) Conceptual graph  
(b) Alpha-Beta pruning in min-max search  
(c) A\* search  
(d) The steps for transforming into Clause Form  
(e) Expert Systems
-



**MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL**

Paper Code : CS-702

**COMPILER DESIGN**

Time Allotted : 3 Hours

Full Marks : 70

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words as far as practicable.*

**GROUP - A**

**( Multiple Choice Type Questions )**

1. Choose the correct alternatives for the following :  $10 \times 1 = 10$

- i) Which of the following is an example of bottom up parsing ?
  - a) LL parsing
  - b) Predictive parsing
  - c) Recursive descent parsing
  - d) Shift-reduce parsing.

- ii) The output of the parser is
  - a) tokens
  - b) syntax tree
  - c) parse tree
  - d) non-terminals.
- iii) If  $x$  is a terminal, then  $FIRST(x)$  is
  - a)  $\epsilon$
  - b)  $\{x\}$
  - c)  $x^*$
  - d) none of these.
- iv) YACC builds up
  - a) SLR parsing table
  - b) LALR parsing table
  - c) canonical LR parsing table
  - d) none of these.
- v) Which one of the following is a top-down parser ?
  - a) Recursive descent parser
  - b) Operator precedence parser
  - c) An LR(k) parser
  - d) An LALR(k) parser.

- vi) Cross-compiler is a compiler
  - a) which is written in a language that is different from the source language
  - b) that generates object code for host machine
  - c) which is written in a language that is same as the source language
  - d) that runs on one machine but produces object code for another machine.

- vii) An ideal compiler should
  - a) be smaller in size
  - b) take less time for compilation
  - c) be written in a high level language
  - d) produce object code that is smaller in size and executes faster.

- viii) Synthesized attribute can easily be simulated by an
  - a) LL grammar
  - b) LR grammar
  - c) ambiguous grammar
  - d) none of these.

- ix) Type checking is normally done during
  - a) lexical analysis
  - b) syntax analysis
  - c) syntax directed translation
  - d) code generation.
- x) The method which merges the bodies of two loops is
  - a) loop rolling
  - b) loop jamming
  - c) constant folding
  - d) none of these.

**GROUP - B**

**( Short Answer Type Questions )**

Answer any *three* of the following. 3 × 5 = 15

- 2. Consider the context-free grammar :
 
$$S \rightarrow SS + \mid SS * \mid \epsilon$$
  - a) How the string  $aa + a*$  can be generated by this grammar ?
  - b) Construct a parse tree for this string. 3 + 2



**GROUP - C**

**( Long Answer Type Questions )**

Answer any *three* of the following.  $3 \times 15 = 45$

3. What is handle ? Consider the grammar  
 $E \rightarrow E + E \mid E * E \mid id$

Find the handles of the right sentential forms of the reduction for the string  $id + id * id$  2 + 3

4. Eliminate the left-recursion for the following grammar :

$$S \rightarrow ( L ) \mid a$$

$$L \rightarrow LS \mid S$$

5. Construct the DAG for the following basic block :

$$d = b * c$$

$$e = a + b$$

$$b = b * c$$

$$a = e - d$$

6. What is recursive descent parsing ? Describe the drawbacks of recursive descent parsing for generating the string 'abc' from the grammar :

$$S \rightarrow aBc$$

$$B \rightarrow bc \mid b$$
 2 + 3

7. a) Construct NFA from the regular expression using Thompson's method  $L = aa ( a \mid b )^* ab$ .

b) Write regular definition for the following language : All strings of letter that contain the five vowels in order.

c) Construct the predictive parsing table for the following grammars :

$$S \rightarrow AaAb \mid BbBa$$

$$A \rightarrow \epsilon$$

$$B \rightarrow \epsilon$$
 5 + 4 + 6

8. Construct the LR(0) set of items and the SLR parsing table for the following grammar :

$$E \rightarrow E + \underline{T} \mid \underline{T}$$

$$T \rightarrow \underline{T} * \underline{F} \mid \underline{F}$$

$$F \rightarrow (\underline{E}) \mid \underline{id}$$
 5 + 10

9. a) Translate the following expression :  
 $m = m + n * - p + n * - p$  into  
(i) Quadruples, (ii) Triples, (iii) Indirect triples.

b) What are the differences among Quadruples, Triples and Indirect triples ?

c) Design a direct acyclic graph for the string :  
 $a + a * ( b - c ) + ( b - c ) * d$   $( 3 + 3 + 3 ) + 3 + 3$

10. a) Consider the following grammar :

$$S \rightarrow CC$$

$$C \rightarrow cC \mid d$$

Find the LR(1) set of items.

b) Describe about the operator precedence parser.

c) What are the two types of attributes that are associated with a grammar symbol ?  $8 + 5 + 2$

=====

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**MAULANA ABUL KALAM AZAD UNIVERSITY OF  
TECHNOLOGY, WEST BENGAL**

**Paper Code : CS-702**

**COMPILER DESIGN**

*Time Allotted: 3 Hours*

*Full Marks: 70*

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words  
as far as practicable.*

*Answer all groups.*

**Group – A**

**(Multiple Choice Type Questions)**

1. Choose the correct alternative of the following: <http://www.makaut.com> 1×10=10
- (i) What is the output of lexical analyzer?
- (a) A parse tree ~~(b)~~ A list of tokens  
(c) A syntax tree (d) None of these
- (ii) Parse tree is generated in the phase of
- ~~(a)~~ Syntax Analysis (b) Semantic Analysis  
(c) Code Optimization (d) Intermediate Code Generation
- (iii) Shift reduce parsers are
- (a) top down parser (b) may be top down or bottom up  
~~(c)~~ bottom up parser (d) None of these
- (iv) The grammar  $S \rightarrow aSa \mid bS \mid c$  is <http://www.makaut.com>
- ~~(a)~~ LL(1) but not LR (1) (b) LR(1) but not LL(1)  
(c) Both LL(1) and LR(1) (d) None of these
- (v) White spaces and Tabs are removed in
- ~~(a)~~ Lexical Analysis (b) Syntax Analysis  
(c) Semantic Analysis (d) All of these

- (vi) Left factoring guarantees
- (a) not occurring of backtracking
  - (b) cycle free parse tree
  - (c) error free target code
  - (d) correct LL(1) parsing table
- (vii) A parse tree showing the values of attributes at each node is called in particular
- (a) syntax tree
  - (b) annotated parse tree
  - (c) syntax direct parse tree
  - (d) direct acyclic graph
- (viii) Which of the following is not true for Dynamic Type Checking?
- (a) It increases the cost of execution
  - (b) Type checking is done during the execution <http://www.makaut.com>
  - (c) All the type errors are detected
  - (d) None of the above
- (ix) Which of the following is not a loop optimization?
- (a) Induction variable elimination
  - (b) Loop jamming
  - (c) Loop unrolling
  - (d) Loop heading
- (x) YACC builds up
- (a) SLR parsing table
  - (b) LALR parsing table
  - (c) Canonical LR parsing table
  - (d) None of these

**Group - B**

**(Short Answer Type Questions)**

Answer *any three* of the following.

5×3=15

2. Describe analysis phase of a Compiler with a block diagram. 5
3. Describe with diagram the working process of Lexical Analyzer. 5
4. What is error handling? Describe the Panic Mode and Phrase Level error recovery technique with example. 1+4=5
5. What is ambiguity in grammar? Justify whether the grammar is ambiguous or not.  
 $A \rightarrow AA \mid (A) \mid a$  2+3=5
6. What is recursive descent parsing? Describe the drawbacks of recursive descent parsing for generating the string 'abc' from the grammar. <http://www.makaut.com>  
 $S \rightarrow aBc$   
 $B \rightarrow bc \mid b$  1+4=5

## Group - C

(Long Answer Type Questions)

Answer any three of the following.

15×3=45

7. Describe with a block diagram the parsing technique of LL(1) parser. Parse the string 'abba' using LL(1) parser where the parsing table is given below.

	a	b	\$
S	$S \rightarrow aBa$		
B	$B \rightarrow \epsilon$	$B \rightarrow bB$	

Check whether the following grammar is LL(1) or not: <http://www.makaut.com>

$$X \rightarrow Yz \mid a$$

$$Y \rightarrow bZ \mid \epsilon$$

$$Z \rightarrow \epsilon$$

4+4+7=15

8. Describe LR parsing with block diagram. What are the main advantages of LR parsing? Construct SLR parsing table for the grammar given below.

$$S \rightarrow Ab$$

$$A \rightarrow bA/a$$

4+3+8=15

9. (a) Construct DFA directly from the regular expression:

$$L = (a \mid b)^*ab$$

(b) What are the main contributions of Syntax Directed Translation in Compiler?

(c) Mention different loop optimization techniques. Optimize the following code:

```
do{
    item = 10;
    x = x + item;
}while (value<50); http://www.makaut.com
```

7+3+5=15

10. (a) Translate the expression  $a = (a + b) * (c + d) + (a + b + c)$  into

(i) Quadruple

(ii) Triple

(iii) Indirect Triple

(b) Draw the flow graph for the following code:

Check (int n) <http://www.makaut.com>

```
flag = 0;
for (i = 2; i < n/2; i++) {
    if (n % i == 0) {
        flag = 1;
        break;
    }
}
if (flag == 0)
    printf("Number is odd");
else print("Number is even");
exit
```

9+6=15

11. Write short notes on *any three* of the following:

5×3=15

- (a) LEX and YAAC
  - (b) Activation Record
  - (c) Symbol Table
  - (d) Left Recursion <http://www.makaut.com>
  - (e) LALR
-



**MAULANA ABUL KALAM AZAD UNIVERSITY OF  
TECHNOLOGY, WEST BENGAL**

**Paper Code : CS-705A**

**INTERNET TECHNOLOGY**

*Time Allotted: 3 Hours*

*Full Marks: 70*

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words  
as far as practicable.*

*Answer all groups.*

**Group – A**

**(Multiple Choice Type Questions)**

1. Choose the correct alternative for each of the following: <http://www.makaut.com> 1×10=10
- (i) ~~M~~HTML documents are saved in
- (a) ~~A~~ ASCII text (b) Machine language codes  
(c) Special binary format (d) None of these
- (ii) The position of SSL in TCP/IP protocol suite is
- (a) ~~b~~ between transport and internet layers. (b) between data link and physical layers.  
(c) ~~c~~ between application and transport layers. (d) None of these
- (iii) The \_\_\_\_\_ in XML is equivalent to the schema in database
- (a) element (b) attribute  
(c) parser (d) ~~d~~ DTD
- (iv) Which syntax is used to describe elements in CSS? <http://www.makaut.com>
- (a) Protectors (b) ~~b~~ Selectors  
(c) Both (a) and (b) (d) None of these

**Turn Over**

- (v) In Telnet, the client echoes the character on the screen but does not send in until a whole line is completed in <http://www.makaut.com>
- (a) default mode  
(b) character mode  
(c) server mode  
(d) None of these
- (vi) HTTP status code is
- (a) two-digit code  
(b) three-digit code  
(c) four-digit code  
(d) five-digit code
- (vii) Cookies are stored in
- (a) Web Server  
(b) Web Browser  
(c) Database Server  
(d) Application Server
- (viii) In IPV4, what is the length of the data field for given an HLEN value of 12 and length value of 40000?
- (a) 39988  
(b) 40012  
(c) 40048  
(d) 39952
- (ix) Which of the following is correct regarding meta tag in HTML?
- (a) `<meta>...</meta>`  
(b) `<meta name = " "/>`  
(c) `<metadata>...</metadata>`  
(d) `<metadata name = " "/>`
- (x) In IPV6 option length is
- (a) 4  
(b) 5  
(c) 3  
(d) infinite

**Group – B**

(Short Answer Type Questions)

Answer any three of the following.

5×3=15

2. Explain the life cycle of a JAVA servlet. <http://www.makaut.com> 5
3. (a) What is Denial-of-service attack?  
(b) Discuss briefly about proxy firewall. 2+3=5
4. Compare POST and GET methods. 5
5. Briefly explain JSP architecture. 5
6. (a) What is cookie?  
(b) Why is HTTP stateless? 2+3=5



## Group – C

(Long Answer Type Questions)

Answer any three of the following.

15×3=45

7. (a) What is URL? Explain different component of URL.

(b) Prepare an XML document for the following table with internal DTD definition:

NAME	STU_ID	Department
Mr. XYZ	STU1	SCE
Mr. ABC	STU2	I.T.

(c) Write a simple servlet program which will return the current data and time.

(1+4)+6+4=15

8. (a) What is Web container? What is servlet engine? <http://www.makaut.com>

(b) What is responsibility of MAIL Transfer agent?

(c) Create a JSP page to find the factorial of a number.

4+6+5=15

9. (a) Illustrate the basic tags of a HTML page with an example.

(b) Explain different stages of SMTP email delivery system with the help of a diagram.

10+5=15

10. (a) Write the steps required to create the DSN.(b) Design a HTML form for registration to a website for a specific service. The form should contain at least one instance of the following form elements: 6+9=15

(i) Text Box

(ii) Check Box

(iii) Select Box

(iv) Submit and Rest Button

(v) Radio Button

11. Write short notes (any three): <http://www.makaut.com>

5×3=15

(a) HTML Image Map

(b) VPN

(c) SMTP

(d) Gateway

(e) Proxy firewall



**MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL**

Paper Code : CS-701

**SOFTWARE ENGINEERING**

Time Allotted : 3 Hours

Full Marks : 70

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words as far as practicable.*

**GROUP - A**

**( Multiple Choice Type Questions )**

1. Choose the correct alternatives for the following :

10 × 1 = 10

- i) DFD shows
  - a) the flow of data
  - b) the processes
  - c) the areas where they are stored
  - d) all of these.
- ii) Coding and testing are done in which of the following manner ?
  - a) Adhoc
  - b) Top-clown
  - c) Cross sectional
  - d) Bottom-up.

[ Turn over

- iii) The largest percentage of total life cycle cost of software is
  - a) Design cost
  - b) Coding cost
  - c) Maintenance cost
  - d) Testing cost.
- iv) Software maintenance includes
  - a) Setting preventing maintenance policy for servers
  - b) Installation of software at site
  - c) Designing of software for maintenance purposes
  - d) Bug fixing.
- v) Main difference between program testing and system testing is
  - a) System testing focuses on testing the interfaces between programs, program testing focuses on individual programs
  - b) Program testing is more comprehensive than system testing
  - c) System testing is tough and program testing is easy
  - d) none of these.

vi) The most creative and challenging phase of system life cycle is

- a) Design
- b) Feasibility study
- c) Maintenance
- d) none of these.

vii) The database design activity deals with the design of [makautonline.com](http://www.makautonline.com)

- a) Logical database
- b) Physical database
- c) both (a) and (b)
- d) none of these.

viii) Coupling is a measure of

- a) Relative functional strength
- b) Interdependence among module
- c) both (a) and (b)
- d) none of these.

ix) Decision support systems are used to

- a) Evaluate and analyze the mission of organization
- b) To perform accounting
- c) Perform multiple activities simultaneously
- d) none of these.

x) Prototype is a

- a) Working model of existing system
- b) Mini model of existing system
- c) Mini model of processed system
- d) none of these.

**GROUP - B**

**( Short Answer Type Questions )**

Answer any *three* of the following.  $3 \times 5 = 15$

2. Explain Spiral Model for software development with a diagram.
3. Why Project Planning is needed ? Draw the diagram for precedence ordering among planning activities.  $2 + 3$
4. Explain Empirical Cost Estimation Techniques.
5. What is meant by cohesion ? How should software be designed considering cohesion ? What is the difference between cohesion and coupling ?  $1 + 2 + 2$
6. Distinguish between error and failure. Which of the two is detected by testing ? Justify your answer.  $2 + 3$

**GROUP - C**  
**( Long Answer Type Questions )**

Answer any *three* of the following. 3 × 15 = 45

7. Suppose you are the Project Manager of a Software Project that consists of following Activities in the table and you have to draw the activity network and find the critical tasks of the project.

Draw the Gantt chart of the Project ( Consider Resources allocation will start from 12th March, 2010 ).

7 + 8

Activity No.	Activity Name	Duration (weeks)	Immediate Predecessor
1.	Obtain Requirements	4	-
2.	Analyze Operations	4	-
3.	Define Subsystems	2	1
4.	Develop Database	4	1
5.	Make Decision Analysis	3	2
6.	Identify Constraints	2	5
7.	Build Module 1	8	3, 4, 6
8.	Build Module 2	12	3, 4, 6
9.	Build Module 3	18	3, 4, 6
10.	Write Report	10	6
11.	Integration And Testing	8	7, 8, 9
12.	Implementation	2	10, 11

8. Consider the following C Program :

```

Int Compute_gcd (x, y )
{
    int x, y ;
    while ( x != y )
        if ( x > y ) then x = x - y ;
        else y = y - y ;
    return x;
}
    
```

- a) Find out the estimated length, Program vocabulary, Program volume, Effort, Time. Comment on the technique that you use to solve the problem.
- b) Compare Halstead's length and volume measures of size with the LOC measure. 10 + 5
9. a) What is SDLCM ? What are the Disadvantages in Classical Waterfall Model ?
- b) Why we use FP instead of LOC ? Why do you think the FP need to be adjusted ?

- c) What is the Heuristic Project Estimation technique ?
- d) A Project size of 200 LOC is to be developed. Software development team has average experience on similar type of project. The project schedule is not very tight. Calculate Effort, Time of Development, Average Staff size and Productivity of the Project.  $(1 + 3) + (2 + 2) + 2 + 5$

10. a) Draw a DFD that depicts and ATM system ( only withdrawal ) mentioning suitable Assumptions. Now build a structure chart.

- b) An embedded system of size 400 KLOC has to develop. Project manager has a choice of hiring from two pools of developers : very highly capable with very little experience ( AEXP very high ) or developers of low quality ( LEXP very low ) but a lot of Experience. Find the values of EAF, Effort & Development Time.  $(5 + 2 + 3) + 5$

11. Write short notes on any *three* of the following : 3 ×
- a) Team Structure of an Organization
  - b) Risk Identification & Assessment
  - c) CASE TOOLS
  - d) Black box testing
  - e) Work Break down Structure & Utility of PERT Chart.



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CS/B.Tech/CSE(O)/ODD/SEM-7/CS-701/2019-20



**MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL**

Paper Code : CS-701

PUID : 07001 (To be mentioned in the main answer script)

**SOFTWARE ENGINEERING**

Time Allotted : 3 Hours

Full Marks : 70

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words as far as practicable.*

**GROUP - A**

**( Multiple Choice Type Questions )**

1. Choose the correct alternatives for any ten of the following : 10 × 1 = 10
- i) Expanded form of the term HIPO is
    - a) Hierarchical Input Process Output
    - b) High-level Input Process Output
    - c) Huge Input Process Output
    - d) none of these.
  - ii) Software consists of
    - a) Set of instructions + operating procedures
    - b) Programs + documentation + operating procedures
    - c) Programs + hardware manuals
    - d) Set of programs.

CS/B.Tech. CSE(O)/ODD, SEM-7/CS-701/2019-20

- iii) SRD stands for
  - a) Software Requirements Definition
  - b) Structured Requirements Definition
  - c) Software Requirements Diagram
  - d) Structured Requirements Diagram.
- iv) Which is not true in context of Decision Tree ?
  - a) Used in white box model
  - b) Perform well with large data
  - c) Handles both categorical and numerical data
  - d) Random forest tree is used for regression type problem.
- v) In software metrics which metrics evaluate the track budget, schedule and human resource ?
  - a) Requirement metrics
  - b) Product metrics
  - c) Process metrics
  - d) None of these.
- vi) From the following which quality deals with maintaining the quality of the software product ?
  - a) Quality assurance
  - b) Quality control
  - c) Quality efficiency
  - d) None of these.
- vii) A COCOMO model is
  - a) Common Cost Estimation Model
  - b) Constructive Cost Estimation Model
  - c) Complete Cost Estimation Model
  - d) Comprehensive Cost Estimation Model

viii) Which depicts flow of control in program modules ?

- a) Flowchart                      b) DFD
- c) Both (a) and (b)            d) None of these.

ix) Which quality deals with the maintaining the quality of the software product ?

- a) Quality assurance            b) Quality control
- c) Quality efficiency            d) None of these.

x) Alpha and Beta testing are forms of

- a) Acceptance testing            b) Integration testing
- c) System testing                d) Unit testing.

xi) If every requirement stated in the Software Requirement Specification (SRS) has only one interpretation, SRS is said to be correct

- a) Unambiguous                    b) Consistent
- c) Verifiable                      d) None of these.

xii) Which of the following primary objectives have to be achieved for the requirement model ?

- a) To describe what the customer requires
- b) To establish a basis for the creation of a software design
- c) To define a set of requirements that can be validated once the software
- d) All of these.

**GROUP - B**

**( Short Answer Type Questions )**

Answer any *three* of the following. 3 x 5 = 15

- 2. Draw a diagram for spiral life cycle.
- 3. What are software validation and verification ?
- 4. Explain about software quality assurance.
- 5. What are white box and black box testing ?
- 6. What is formal technical review (FTR) ? What are the differences among fault, failure and error ?

**GROUP - C**

**( Long Answer Type Questions )**

Answer any *three* of the following. 3 x 15 = 45

- 7. a) Explain when and why you will use PERT charts and when and why you will use Gantt charts while you are project manager. 4
- b) Consider a software project with 5 activities  $T_1$  to  $T_5$ . Duration of 5 activities in weeks are 3, 2, 3, 5, 2 respectively.  $T_2$  and  $T_4$  can start when  $T_1$  is complete.  $T_3$  can start when  $T_2$  is complete.  $T_5$  can start when both  $T_3$  and  $T_4$  are complete. Draw activity network for the project. When is the latest start date of the activity  $T_3$  ? What is the float of the activity  $T_4$  ? Which activities are on the critical path ? Draw the Gantt chart also.

http://www.makaut.com 3 + 1 + 1 + 3 + 3

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8. What is reliability? Define RCOF, POFOF, MTTF and MTTR. What is cyclomatic complexity? Write a C program to calculate GCD of two numbers and calculate the cyclomatic complexity of your program.

2 + 8 + 1 + 4

The following table indicates the various tasks involved in completing a software project, the corresponding activities and the estimated effort for each task in person-months:

Notation	Activity	Effort in person-months
$T_1$	Requirements Specification	1
$T_2$	Design	2
$T_3$	Code actuator interface module	2
$T_4$	Code sensor interface module	5
$T_5$	Code user interface part	3
$T_6$	Code control processing part	1
$T_7$	Integrate and test	6
$T_8$	Write user manual	3

The precedence relation  $T_i \rightarrow \{T_j, T_k\}$  implies that the tasks  $T_i$  must complete before either tasks  $T_j$  or  $T_k$  can start. The following precedence relation is known to hold among different tasks  $T_1 \rightarrow T_2 \rightarrow \{T_3, T_4, T_5, T_6\} \rightarrow T_7$ .

CS/B.Tech/CSE(O)/ODD/SEM-7/CS-701/2019-20

- a) Draw the Activity Network and the Gantt chart representations for the project.  
 b) Explain why the spiral life cycle model is considered to be a meta model.  
 c) Explain the disadvantages of prototype model.

7 + 4 + 4

10. Write short notes on any three of the following: 3 x 5

- a) Spiral model  
 b) UML diagrams  
 c) Incremental model of software development  
 d) Integration & Load testing  
 e) Decision tree and Decision table.

11. a) Why is intermediate COCOMO expected to give more accurate estimates than the basic COCOMO?  
 b) Use a schematic diagram to show the order in COCOMO estimation technique for  
 i) cost  
 ii) effort  
 iii) duration  
 iv) size.

- c) 'Consider Roxy Roll Centre, a restaurant near College Street, Kolkata, owned by Sourav. Some are convinced that its Egg-Chicken Rolls are the best in College Street. Many people, especially Presidency University students and faculties, frequently eat at



CS/B Tech/CSE(01)/ODD/SEM-7/CS-701/2019-20

Roxy. The restaurant uses an information system that takes customer orders, sends the orders to the kitchen, monitors goods sold and inventory and generates reports for management

Draw the context diagram and Level 1 DFD for the Roxy's food ordering system. Also draw a Level 2 DFD that will show the decomposition of any one process from Level 1 DFD.  $3 \times 3 + (2 \times 4 \times 3)$



**MAULANA ABUL KALAM AZAD UNIVERSITY OF  
TECHNOLOGY, WEST BENGAL**

**Paper Code : EC-503**

**PUID : 05054 (To be mentioned in the main answer script)**

**CONTROL SYSTEM**

*Time Allotted : 3 Hours*

*Full Marks : 70*

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own  
words as far as practicable,*

**GROUP - A**

**( Multiple Choice Type Questions )**

1. Choose the correct alternatives for any ten of the following : 10 × 1 = 10
- i) If the root locus lies only on the negative real axis then the time response is
- a) overdamped
  - b) underdamped
  - c) oscillatory
  - d) sustained oscillations.

- ii) The steady state error is determined as the difference between the reference input and the system output at
- a)  $t = t_p$
  - b)  $t = \text{infinity}$
  - c)  $t = \text{Time constant}$
  - d)  $t = 0.$
- iii) The transfer function is  $\frac{k}{(s+1)(s+2)(s+3)}$ . The break point will lie between
- a) 0 & -1
  - b) -1 & -2
  - c) -2 & -3
  - d) beyond -3.
- iv) The terms in the first column of Routh's array of a characteristic equation are 6, 9, 2, 4, -3. Then number of roots of characteristic equation in the right half of s-plane is equal to
- a) 0
  - b) 3
  - c) 4
  - d) 1.
- v) Given that the transfer function  $G(s)$  is  $\frac{K}{s^2(1+sT)}$ . The type and order of the system are
- a) 2 & 3
  - b) 3 & 2
  - c) 3 & 3
  - d) 2 & 2.

- vi) The characteristic equation of a second order system is  $s^2 + 6s + 25 = 0$ . The system is
- a) underdamped                      b) overdamped  
 c) undamped                          d) critically damped.
- vii) A second order control system with  $\xi = 0$  is always
- a) marginally stable                  b) stable  
 c) unstable                              d) cannot be said.
- viii) A system has 4 poles and one zero. Its high frequency asymptote in its magnitude plot has a slope of
- a) - 100 dB/decade                  b) 100 dB/decade  
 c) - 60 dB/decade                  d) 60 dB/decade.
- ix) The origin for the investigation of closed-loop stability in relation to Nyquist criterion is
- a)  $-1 + j0$                               b)  $1 - j0$   
 c)  $0 + j1$                                 d)  $0 - j1$ .
- x) The frequency at which the phase curve of a Bode plot crosses  $-180^\circ$  line is called
- a) natural frequency  
 b) phase crossover frequency  
 c) gain crossover frequency  
 d) corner frequency.

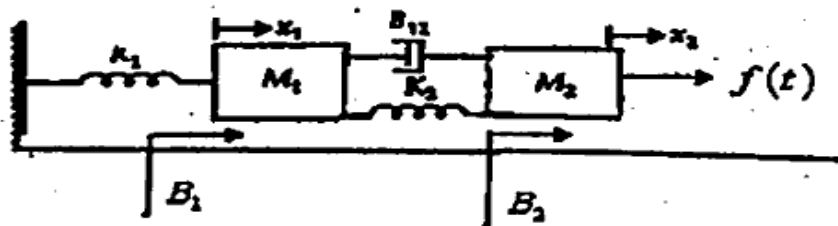
- xi) -20 dB/decade is equivalent with
- a) -40 dB/octave                      b) -8 dB/octave  
 c) -18 dB/octave                     d) -6 dB/octave.
- xii) The slope of asymptotic Bode plot at low frequencies for a type 3 transfer function is
- a) -30 dB/decade                      b) -60 dB/decade  
 c) -20 dB/decade                     d) -40 dB/decade.

**GROUP - B**

**( Short Answer Type Questions )**

Answer any *three* of the following.       $3 \times 5 = 15$

2. Find the equivalent force-voltage analogy circuit of the following mechanical translational system.      5



3. A unity feedback control system  $G(S) = \frac{K(S + \alpha)}{(S + \beta)^2}$  is to be designed to meet the following specifications. Steady state error for a unit step input is 0.1. Damping ratio  $\xi = 0.5$ , natural frequency of oscillation  $\omega_n = \sqrt{10}$ . Find the values of K,  $\alpha$  and  $\beta$ .      5

4. The characteristic equation of a feedback system is  $s^4 + 4s^3 + 16s^2 + 16s + 48 = 0$ . Check whether the system is oscillatory. If so, determine the frequency of oscillation using Routh-Hurwitz criteria. 5
5. The open loop transfer function of a feedback system is  $G(s)H(s) = \frac{k(1+s)}{1-s}$ . Comment on stability using Nyquist plot. 5
6. What are the properties of state transition matrix? 5

**GROUP - C**

**( Long Answer Type Questions )**

Answer any *three* of the following.  $3 \times 15 = 45$

7. a) The open loop transfer function of a unity feedback control system is given by  $G(s) = \frac{K}{s(s^2 + s + 1)(s + 4)}$ .

Applying Routh-Hurwitz criterion, discuss the stability of close loop system as a function of  $K$ . Determine the value of  $K$  which will cause sustained oscillation in the closed loop system. What is the corresponding oscillation frequency?

- b) The close loop (-ve feedback) system with forward path transfer function  $G(s) = \frac{91.8}{S(S+6)}$ , and feedback path transfer function  $H(s) = 0.2$  with given unit step input. Determine the damping ratio ( $\xi$ ), Maximum over shoot ( $M_p$ ), Rise time ( $t_r$ ). 8 + 7

8. a) Sketch the Root locus for the open loop transfer function of a unity feedback control system given below :

$$G(s)H(s) = \frac{K}{s(s+4)(s^2+4s+20)}$$

Show all relevant steps.

- b) What is the 'Analogous system' ? Explain the 'Force-current analogy'. 12 + 1 + 2

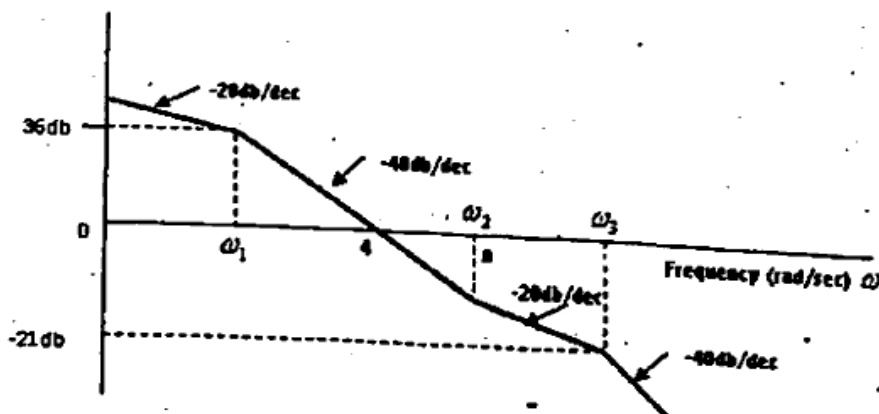
9. Sketch the asymptotic Bode plot for the transfer function given  $G(s)H(s) = \frac{2(s+0.25)}{s^2(s+1)(s+0.5)}$ . From the

Bode plots determine i) P.C.F ii) G.C.F iii) PM iv) GM (All have usual meaning) for above transfer functions and mention about the stability condition.

10. a) Given the open loop transfer function  $G(s) = \frac{K(S+2)}{(S+1)(S-1)}$  where  $K = 1$ . Draw the complete

Nyquist plot and determine the stability of close loop system.

- b) For the Bode plot shown in the figure below, find the transfer function. 10 + 5



11. a) Consider characteristic equations of the system given below. How many roots of characteristic equation are in the right half, left half and on  $j\omega$  axis ? Find the stability condition using R-H criteria.

$$s^6 + s^5 + 8s^4 + 6s^3 + 20s^2 + 8s + 16 = 0$$

- b) The open loop transfer function of a unity feedback control system is given by  $G(s) = \frac{K}{s(1+s)(1+0.1s)}$

- i) State the corner frequencies ii) Determine the gain  $K$  for gain crossover frequency of 5 rad/second.
- c) How can you determine the stability condition from Bode plot using gain margin (GM) and phase margin (PM). Show the different conditions of stability.

5 + 5 + 5

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**MAULANA ABUL KALAM AZAD UNIVERSITY OF  
TECHNOLOGY, WEST BENGAL**

**Paper Code : EC-504B**

**DATA STRUCTURE & C**

*Time Allotted: 3 Hours*

*Full Marks: 70*

*The figures in the margin indicate full marks.  
Candidates are required to give their answers in their own words  
as far as practicable.*

**Group – A**

**(Multiple Choice Type Questions)**

- I. Choose the correct alternative for *any ten* of the following: 1×10=10
- (i) Insert a new node after given a node in a doubly linked list requires
    - (a) four pointer exchanges.
    - (b) two pointer exchanges.
    - (c) one pointer exchanges.
    - (d) no pointer exchanges.
  - (ii) Maximum possible height of an AVL Tree with 7 nodes is
    - (a) 3
    - (b) 4
    - (c) 6
    - (d) None of these
  - (iii) If a binary tree is threaded for inorder traversal, a right NULL link of any node is replaced by the address of its
    - (a) Successor
    - (b) Predecessor
    - (c) Root
    - (d) Own
  - (iv) Total nodes in a 2-tree (Strictly binary tree) with 30 leaves will be
    - (a) 60
    - (b) 58
    - (c) 59
    - (d) 57
  - (v) The initial configuration of queue is  $a, b, c, d$  ('a' is at the front). To get the configuration  $d, c, b, a$  one needs a minimum of
    - (a) 2 deletions and 3 additions
    - (b) 3 deletions and 2 additions
    - (c) 3 deletions and 3 additions
    - (d) 3 deletions and 4 additions

- (vi) Adjacency matrix of digraph is
- (a) identify matrix (b) symmetric matrix  
(c) asymmetric matrix (d) None of these
- (vii) The Ackerman function, for all non-negative values of  $m$  and  $n$  is recursively defined as
- $$\begin{aligned} A(m,n) &= n+1 && \text{if } m=0 \\ &= A(m-1, 1) && \text{if } m \neq 0 \text{ but } n=0 \\ &= A(m-1, A(m, n-1)) && \text{if } m \neq 0 \text{ but } n \neq 0 \end{aligned}$$
- Therefore the value of  $A(1, 2)$  is
- (a) 4 (b) 3  
(c) 5 (d) 2
- (viii) Which of the following traversal techniques lists the elements of a binary search tree in ascending order?
- (a) Preorder (b) Postorder  
(c) Inorder (d) None of these
- (ix) The method of linear probing for collision resolution can lead to
- (a) Clustering (b) Efficient storage utilization  
(c) Overflow (d) Underflow
- (x) A complete Binary tree with  $n$  leaves contains
- (a)  $n$  nodes (b)  $2n$  nodes  
(c)  $2n-1$  nodes (d)  $2^n$  nodes
- (xi) The following sequence of operations performed on a stack:  
push(1), push(2), pop, push(1), push(2), pop, pop, pop, push(2), pop.  
The sequence of popped out values are
- (a) 2,2,1,1,2 (b) 2,2,1,2,2  
(c) 2,1,2,2,1 (d) 2,1,2,2,2

### Group – B

#### (Short Answer Type Questions)

Answer any three of the following.

5×3=15

- Write an algorithm to insert the  $n$ th node of a singly linked list. The Error conditions are to be handled properly.
- Each element of an array `arr [20][50]` requires 4 bytes of storage. Base address of the array `arr` is 2000. What will be the address of `arr [10][10]` when the elements are stored in row-major and column-major order?
- What is an Abstract data type? Define as ADT for a list.

2+3=5

5. Given below are the Pre-order and In-order traversals of a binary tree. Draw the actual tree and write its Post-order traversal:  
 Pre-order Traversal : A B D I E J C F G K  
 In-order Traversal : D I B E J A F C K G 4+1=5
6. Define sparse matrix. How is sparse matrix efficient for storing data elements? Explain diagrammatically.

**Group – C**

**(Long Answer Type Questions)**

**Answer any three of the following.**

**15×3=45**

7. (a) Let  $a$  and  $b$  denotes positive integers. Suppose a function  $Q$  defined as follows:

$$Q(a, b) = \begin{cases} 0 & \text{if } a < b \\ Q(a-b, b) + 1 & \text{if } b \leq a \end{cases}$$

Find the value of  $Q(2, 3)$  and  $Q(14, 3)$ .

- (b) Why the Queue data structure is called FIFO?

- (c) Construct the following Queue of characters where Queue is a circular array which is allocated six memory cells:

FRONT = 2 REAR = 4 QUEUE : -, A, C, D -, -

Describe the following operations take place:

- (i) 'F' is added to the Queue.
- (ii) Two letters are from the Queue.
- (iii) 'K', 'L', 'M' are added to the queue.
- (iv) Two letters are deleted from the queue.
- (v) R is added to the Queue.
- (vi) One letter is deleted from the queue.

- (d) Write an algorithm to add two polynomials using link list.

**3+2+6+4=15**

8. (a) Show the stages in growth of an order -4 B-Tree when the following keys are inserted in the order given: <https://www.makaut.com>

74, 72, 19, 87, 51, 10, 35, 18, 39, 60, 76, 58, 19, 45

- (b) How do AVL trees differ from binary search tree?

Build an AVL tree with node inserted in the following order:

8, 12, 9, 11, 7, 6, 62, 15, 3

Clearly mention different rotations used and balance factor of each node.

- (c) Prove that, for any non-empty binary tree  $T$ , if  $n_0$  is the number of leaves and  $n_2$  be the number of nodes of degree 2, then  $n_0 = n_2 + 1$ .

**5+(2+4)+4=15**

9. (a) Convert the following infix expression to postfix notation by showing the operator stack and output string after reading each input taken:

$$A * B + C * (D - E) - F * G$$

- (b) By applying the algorithm of postfix expression evaluation using stack find the result of the given following postfix expression:

$$12, 7, 3, -, /, 2, 1, 5, +, *, +$$

- (c) Write a recursive function for the problem of 'Tower of Hanoi'.

$$5+5+5=15$$

10. (a) Define Hashing.

- (b) Briefly explain the different commonly used hash functions.

- (c) Explain with suitable example the collision resolution scheme using linear probing with open addressing.

- (d) Write an algorithm to delete from a Binary Search Tree.

$$2+4+4+5=15$$

11. Answer *any three* of the following:

$$5 \times 3 = 15$$

- (i) Prim's Algorithm
- (ii) Threaded Binary Tree
- (iii) BFS and DFS
- (iv) Asymptotic notation
- (v) Merge sort

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**CS/B.TECH/ECE(O)/ODD/SEM-7/EC-702/2019-20**



**MAULANA ABUL KALAM AZAD UNIVERSITY OF  
TECHNOLOGY, WEST BENGAL**

**Paper Code : EC-702**

**PUID : 07076 (To be mentioned in the main answer script)**

**MICROELECTRONICS & VLSI DESIGN**

*Time Allotted : 3 Hours*

*Full Marks : 70*

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own  
words as far as practicable.*

**GROUP - A**

**( Multiple Choice Type Questions )**

1. Choose the correct alternatives for any ten of the following :  $10 \times 1 = 10$
- i) Frequency compensation for an op-amp can be achieved by
    - a) increasing gain
    - b) minimizing overall phase shift
    - c) adding a zero
    - d) none of these.

CS/B.TECH/ECE(O)/ODD/SEM-7/EC-702/2019-20

- ii) Slant in ( $I_D-V_{D_S}$ ) occurs due to
- a) body effect
  - b) velocity saturation
  - c) channel length modulation
  - d) mobility degradation.
- iii) Which is not a part of FPGA ?
- a) Configurable logic block
  - b) IOB
  - c) Microprocessor
  - d) Routing Channels.
- iv) Which are the simple PLDs ?
- a) CPLD
  - b) FPGA
  - c) CBIC
  - d) PLA.
- v) How many CMOS transistors are needed to implement XOR gates ?
- a) 7
  - b) 10
  - c) 8
  - d) 9.
- vi) What is full form of VHDL ?
- a) Very high speed integrated circuit Hardware description language (HDL)
  - b) Vast HDL
  - c) Very simple HDL
  - d) Very high HDL.

- vii) What is ASIC ?
- a) Application simplified IC
  - b) Applied IC
  - c) Application specific IC
  - d) Authentic IC.
- viii) VLSI design flow is a
- a) cyclic process only
  - b) parallel process
  - c) sequential & cyclic process
  - d) none of these.
- ix) VHDL is a
- a) multithreaded program
  - b) language like C
  - c) single user program
  - d) multiuser program.
- x) The output of physical design is
- a) circuit
  - b) layout
  - c) logical model
  - d) RTL schematic.
- xi) Typical manufacturing defects in IC fabrication are
- a) layer to layer shorts
  - b) discontinuous wires
  - c) missing or damaged vias
  - d) any one of these.

**GROUP - B**

**( Short Answer Type Questions )**

Answer any *three* of the following.  $3 \times 5 = 15$

2. Draw layout of MOSFET.
3. Design NOR with CMOS logic.
4. Define op-amp ? Explain the characteristics of op-amp.
5. Implement the following Boolean functions with TG logic :
  - a)  $Y = ab' + bc + c'a$
  - b)  $F = ab' + a'bc$
6. Proof that  $(W/L)_P = 2.5 (W/L)_N$ .

**GROUP - C**

**( Long Answer Type Questions )**

Answer any *three* of the following.  $3 \times 15 = 45$

7. What are the different types of ASIC ? Explain briefly all of them.  $6 + 9$
8. Explain the VTC curve of CMOS logic. Calculate the  $V_{th}$  of CMOS inverter.  $7 + 8$
9. What do you mean by twin tub ? Explain the p-well CMOS fabrication process with necessary diagram.  $4 + 11$
10. Define Y chart. Explain it. What do you mean by regularity, locality, modularity.  $3 + 3 + 3 + 3 + 3$
11. Write short notes on any *three* of the following :  $3 \times 5$ 
  - a) CMRR
  - b) Domino logic
  - c) 6 transistor XOR design.
  - d) Edge triggered D flipflop.





**MAULANA ABUL KALAM AZAD UNIVERSITY OF  
TECHNOLOGY, WEST BENGAL**

**Paper Code : EC-701**

**WIRELESS COMMUNICATION & NETWORK**

*Time Allotted: 3 Hours*

*Full Marks: 70*

*The figures in the margin indicate full marks.  
Candidates are required to give their answers in their own words  
as far as practicable.*

**Group – A**

**(Multiple Choice Type Questions)**

**1. Choose the correct alternative for any ten of the following:**

**1×10=10**

(i) Soft hand-off is used by

(a) GSM

(b) ARMS

(c) USDC

(d) CDMA

(ii) The concept of “frequency reuse” technique is used in

(a) cellular system

(b) conventional mobile telephony

(c) paging system

(d) cordless telephony

(iii) If the bandwidth of the transmitted signal is larger than the channel coherence bandwidth, then the signal could be severely influenced by

(a) Frequency selective fading.

(b) Flat fading.

(c) Fast fading.

(d) Slow fading.

(iv) Bluetooth is a

(a) a wireless LAN.

(b) WAN.

(c) short range infrared ad-hoc.

(d) short range wireless ad-hoc LAN service.

(v) Interference on voice channel usually causes

(a) missed calls

(b) blocked calls

(c) dropped calls

(d) cross talk

(vi) Mobile IP refers to

- (a) mobility
- (b) IP tuning
- (c) IP within IP
- (d) All of these

(vii) Free space propagation path loss is

- (a) inversely proportional to frequency of transmission.
- (b) directly proportional to frequency of transmission.
- (c) independent of frequency of transmission.
- (d) directly proportional to square of the frequency of transmission.

(viii) Cells using the same set of frequencies are called

- (a) Neighbouring cells
- (b) Adjacent channel cells
- (c) Co-channel cells
- (d) Clusters

(ix) For a given frequency re-use ration of 3, the cluster size is

- (a) 3
- (b) 4
- (c) 7
- (d) 12

(x) The basic frequency region on GSM is

- (a) 900 MHz
- (b) 1800 MHz
- (c) 1900 MHz
- (d) All of these

(xi) Cordless phones can operate at

- (a) 4.2 GHz
- (b) 3.8 GHz
- (c) 5.8 GHz
- (d) 6.2 GHz

(xii) Data rate for 3G fast moving vehicle wireless network is

- (a) 144 Kbps
- (b) 384 Kbps
- (c) 2 Mbps
- (d) 1 Mbps

(xiii) In digital cellular telephony GSM uses 1800 MHz frequency band which uses uplink and downlink frequency. The difference of frequency 75 MHz is divided into

- (a) 150 carrier channel
- (b) 374 carrier channel
- (c) 210 carrier channel
- (d) 390 carrier channel

**Group – B**

**(Short Answer Type Questions)**

5×3=15

Answer any three of the following.

2. Prove that for a hexagonal cell geometry, the co-channel reuse ratio is given by  $Q = \sqrt{3N}$  where  $N = i^2 + ij + j^2$ .
3. Compare GSM and CDMA.
4. Draw and explain the block diagram of GPRS Network Architecture.
5. Explain with diagrams the different hand-off processes used in CDMA-based cellular network.
6. How does a wireless LAN with IEEE 802.11 standard try to solve collisions or minimize the probability of collisions?

**Group – C**

**(Long Answer Type Questions)**

15×3=45

Answer any three of the following.

7. (a) What is Multiple access?  
(b) Define spectral efficiency. What are the factors which determine the spectral efficiency of a wireless system?  
(c) Calculate the spectral efficiency in FDMA systems.  
(d) The total bandwidth in an AMPS cellular system is allocated as 12.5 MHz. Using FDMA, 416 number of available channels with a spacing of 30 kHz are allocated to the users.  
(i) What is the guard bandwidth used in the system?  
(ii) What is the spectral efficiency for this system if there are 21 channels used for control signalling?

2+(2+2)+5+(2+2)=15

8. (a) Draw the basic block diagram of 3G UMTS mobile architecture. Explain its operation.  
(b) What are the functions of RNC and Node B in UMTS?  
(c) What are the frequency bands allocated for UMTS?  
(d) What are the attach detach procedures in GPRS?

(3+3)+(2+2)+2+3=15

9. (a) Discuss two-ray propagation model and explain how it differs from free space propagation path model.  
(b) Show how velocity of a mobile set may cause fading in cellular communication.  
(c) Find the Fraunhofer distance for an antenna with maximum dimensions of 1 meter and operating frequency of 900 MHz. If antennas have unity gain, calculate the path loss in dB. Assume system loss factor,  $L = 1$ . 6+5+4=15
10. (a) What is mobile IP and why is it needed?  
(b) Explain the main three phases of MIPv4.  
(c) Explain with neat diagram how mobile node registers its current location with Foreign Agent and Home Agent in MIPv4.  
(d) What is Tunneling in MIPv4? (3+2)+3+5+2=15
11. Write short notes on *any three* of the following:  
(a) Code Division Multiple Access  
(b) GSM logical channels  
(c) Capacity enhancement techniques for cellular networks  
(d) CSMA/CD vs. CSMA/CA  
(e) WiMAX

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**CS/B.TECH/ECE/EVEN/SEM-6/EC-601/2018-19**



**MAULANA ABUL KALAM AZAD UNIVERSITY OF  
TECHNOLOGY, WEST BENGAL**

**Paper Code : EC-601**

**DIGITAL COMMUNICATION**

**Time Allotted : 3 Hours**

**Full Marks : 70**

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words as far as practicable.*

**GROUP - A**

**( Multiple Choice Type Questions )**

1. Choose the correct alternatives for any ten of the following : 10 × 1 = 10
- i) What are the disadvantages of digital communication ?
- a) Needs more bandwidth
  - b) Is more complex
  - c) Both (a) and (b)
  - d) None of these.
- ii) The characteristics of compressor in  $\mu$ -law companding are
- a) continuous in nature
  - b) logarithmic in nature
  - c) linear in nature
  - d) discrete in nature.

[ Turn over

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B.TECH/ECE/EVEN/SEM-6/EC-601/2018-19

- iii) Which of the following modulation is digital in nature ?
- a) PAM
  - b) PPM
  - e) PCM
  - d) DM.
- iv) One of the disadvantages of PCM is
- a) it requires large bandwidth
  - b) very high noise
  - c) cannot be decoded easily
  - d) all of these.
- v) Flat-top sampling leads to
- a) an aperture effect
  - b) aliasing
  - c) loss of the sign
  - d) none of these.
- vi) Which is the most commonly used line coding format with best overall desirable properties ?
- a) P-NRZ
  - b) P-RZ
  - c) BP-AMI-RZ
  - d) UP-RZ.
- vii) Regenerative repeaters are used for
- a) eliminating noise
  - b) reconstruction of signals
  - c) transmission over long distances
  - d) all of these.
- viii) The advantage of using Manchester format of coding is
- a) power saving
  - b) polarity sense at the receiver
  - c) noise immunity
  - d) none of these.
- ix) What is the probability of drawing two clubs from a well shuffled pack of 52 cards ?
- a)  $13/51$
  - b)  $2/52$
  - c)  $1/26$
  - d)  $1/17$ .
- x) If the baud rate of QPSK is 400 the bit rate is
- a) 100
  - b) 400
  - c) 800
  - d) 1600.

- xi) In coherent detection of signals
- a) local carrier is generated synchronized with modulated carrier
  - b) local carrier is generated with random phase
  - c) all of these
  - d) none of these.

**GROUP - B**

**( Short Answer Type Questions )**

Answer any *three* of the following.  $3 \times 5 = 15$

2. Write the advantages and disadvantages of digital communication system over analog communication system.
3. For the data bit 10110001, draw the waveforms for ASK, FSK, PSK and QPSK.
4. What is companding ? State A-law and  $\mu$ -law.
5. Explain in brief the properties of line coding.
6. What is quantization error ? How does it depend upon the step size ? Suggest some methods to overcome the difficulties encountered when the modulating signal amplitude swing is very large.  $1 + 2 + 2$

**GROUP - C**

**( Long Answer Type Questions )**

Answer any *three* of the following.  $3 \times 15 = 45$

7. a) Draw the block diagram for generation and detection of the BPSK signal and explain its operation clearly.  $3 + 3$
- b) List the advantages and disadvantages of DPSK modulation technique.  $4$
- c) A binary data stream 10111000 is to be transmitted using DPSK. Show that the reconstruction of the signal by the DPSK technique is independent of the choice of the extra bit.  $5$

CS/B.TECH/ECE/EVEN/SEM-6/EC-601/2018-19

8. a) Explain the principle of PCM system with neat diagram. Derive the expression in dB for signal to noise ratio of PCM system. 4 + 5
- b) A PCM system uses a uniform quantizer followed by a 7-bit binary encoder. The bit rate of the system is equal to 50 kbps.
- i) What is the maximum message signal bandwidth for which the system operates satisfactorily?
- ii) Calculate the output signal to quantization noise ratio when a full-load sinusoidal modulating wave of 1-MHz frequency is applied to the input. 6

9. a) What is Nyquist criterion for Inter-symbol interference? 5
- b) How is eye diagram useful to detect the effect of ISI? 4
- c) Write down sampling theorem. Discuss different methods of sampling. 2 + 4
10. a) Explain the function of equalizer and bit-synchronizer in regenerative repeaters. 6
- b) Draw the block diagram of an early late bit synchronizer. 4
- c) Design a 3-tap zero forcing equalizer for a distorted received pulse  $p(t)$ , where

$t$	$-3T_b$	$-2T_b$	$-T_b$	$0$	$T_b$	$2T_b$	$3T_b$
$p(t)$	0	0	0.1	1	-0.2	0.1	0

Draw the equalized pulse.

11. Write short notes on any three of the following : 3 x 5
- a) Regenerative repeater
- b) MSK
- c) Properties of line coding
- d) Adaptive Delta Modulation
- e) Zero forcing equalizer.



**CS/B.TECH (ECE)/EVEN/SEM-6/EC-602/2018-19**



**MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL**

**Paper Code : EC-602**

**DIGITAL SIGNAL PROCESSING**

**Time Allotted : 3 Hours**

**Full Marks : 70**

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words as far as practicable.*

**GROUP - A**

**( Multiple Choice Type Questions )**

1. Choose the correct alternatives for any ten of the following : 10 × 1 = 10

i) Which of the following is a periodic signal ?

~~a)  $x(n) = C u(n)$~~

b)  $x(n) = C e^{-jbn}$

c)  $x(n) = C e^{bn}$

d)  $x(n) = Cn$ .

ii) Which of the following is the causal system ?

~~a)  $y(n) = x(n^2)$~~

b)  $y(n) = x^2(n)$

c)  $y(n) = x(-n)$

d)  $y(n) = x(2n)$ .



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iii) The ROC of a causal signal  $x(n)$  is

- a) Entire z-plane
- b) Region in between two concentric rings
- c) Right of pole
- d) Left of pole.

iv) For a continuous time LTI system which of the following statements is are true ?

- 1) The transfer function is the ratio of Laplace transform of output and input.
- 2) The transfer function is the ratio of Laplace transform of input and output.
- 3) The transfer function is the ratio of Laplace transform of impulse response.

of these <http://www.makaut.com>

- a) 1 only
- b) 1 and 3
- c) 2 only
- d) 3 only.

v) Fourier Transform of Gaussian pulse will be

- a) another Gaussian pulse
- b) squared sinc pulse
- c) impulse train
- d) sinc pulse.

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xi) The sampling frequency of the following analog signal  $x(t) = 4 \sin 100\pi t + 2 \cos 50\pi t$  is

- a) greater than 75 Hz
- b) greater than 150 Hz
- c) less than 150 Hz
- d) greater than 100 Hz.

xii) For energy signals, the energy will be finite and the average power will be

- a) infinite
- b) finite
- c) zero
- d) unity.

### GROUP - B

( Short Answer Type Questions )

Answer any *three* of the following.  $3 \times 5 = 15$

2. Determine the energy and power of the following signal :

i)  $X(t) = e^{-n}u(n)$     ii)  $x(n) = u(n)$  2 + 3

3. Show that  $u[n] = \sum_{k=0}^{\infty} \delta[n - k]$  and  $\delta[n] = u[n] - u[n - 1]$  3 + 2

4. Draw the even part and odd part of the following signal

$$x(n) = [1 \ 2 \ 3 \ 4]$$

5. Find  $h(n)$  for the system difference equation :

$$y(n) + 2y(n-1) + y(n-2) = x(n)$$

6. Z transform of  $x(n)$  is  $X(Z) = \frac{z^2 + 2}{z^3 + 3z^2 + 4}$ . Find

Z transform of  $3^n x(n)$  and  $x(-n)$ . 2 + 3

### GROUP - C

#### ( Long Answer Type Questions )

Answer any *three* of the following. 3 × 15 = 45

7. a) Check the causality, linearity and time invariance of the following systems :

i)  $y[n] = x[-n]$                       ii)  $y(n) = n^2 x(n)$

b) Find convolution of

$$x_1[n] = u[n] \text{ and } x_2[n] = 2^{-n} u[n]$$

c) Discuss the stability of digital system in time domain with suitable example. 3 + 7 + 5

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8. a) Find  $h(n)$  given  $H(z) = e^z + e^{1/z}$

b) Find the Z transform of

$$x(n) = nu(n)$$

c) Find all possible  $x(n)$  for given

$$X(Z) = \frac{1}{1 - 1.5z^{-1} + 0.5z^{-2}}$$

5 + 4 +

9. a) Find DFT of  $x(n) = [1 \ 2 \ 6 \ 4]$  and plot amplitude and phase spectrum.

b) Explain circular shift with suitable example.

c) Find circular convolution  $x(n) = [1 \ 2 \ 1 \ 4]$  and  $x_1(n) = [1 \ 3 \ 1 \ 5]$

5 + 5 + 5

10. a) An 8-point sequence is given by

$x(n) = [2 \ 1 \ 2 \ 1 \ 1 \ 1 \ 1 \ 1]$ . Compute 8-point DFT of  $x(n)$  by radix-2 DIT FFT. Also sketch the magnitude and phase spectrum.

b) Compare DIT-FFT and DIF-FFT.

12 + 3

11. a) Design linear phase FIR high pass filter with cut-off frequency of  $0.8\pi$  rad/sample by taking 7 samples window sequence.

b) Compare FIR and IIR filter.

12 + 3

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**2. Write short notes on any three of the following : 3 × 5**

- a) **Auto-correlation and Cross-correlation**
  - b) **Bilinear Transformation**
  - c) **Overlap add method**
  - d) **Radix-2 DIF FFT Algorithm**
  - e) **Instruction pipelining in TMS320C5x.**
- 

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**MAULANA ABUL KALAM AZAD UNIVERSITY OF  
TECHNOLOGY, WEST BENGAL**

**Paper Code : EC-603**

**TELECOMMUNICATION SYSTEM**

**Time Allotted : 3 Hours**

**Full Marks : 70**

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words as far as practicable.*

**GROUP - A**

**( Multiple Choice Type Questions )**

1. Choose the correct alternatives for any ten of the following : 10 × 1 = 10
- i) ..... cable consists of an inner copper core and a second conducting outer sheath.
- a) Twisted-pair                      b) Shielded twisted-pair  
c) Coaxial                              d) Fiber-optic.
- ii) The local loop has ..... cable that connects the subscriber telephone to the nearest end office.
- a) fiber-optic                      b) coaxial  
c) twisted-pair                      d) none of these.
- iii) Attenuation can be reduced in subscriber loop by using
- a) higher diameter in copper wire  
b) series of inductance in line  
c) lower diameter in copper wire  
d) series of capacitance in line.



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- iv) Crossbar switching system is
- a) Electromechanical
  - b) Electronic
  - c) Analog
  - d) Digital switching system.
- v) ESS stands for
- a) Electronic Switching System
  - b) Effective Electronic Switching System
  - c) Early Electronic Switching System
  - d) none of these.
- vi) MTTR means
- a) Mean Time To Repair
  - b) Maximum Time To Repair
  - c) Most Time To Repair
  - d) Mean Time To Represent.
- vii) One Erlang is equal to
- a) 36 CCS
  - b) 3600 CCS
  - c) 60 CCS
  - d) none of these.
- viii) If PCM samples are switched, switching is known as
- a) analog time division switching
  - b) digital time division switching
  - c) time division switching
  - d) none of these.
- ix) In ..... signaling, a portion of the bandwidth is used for signaling and another portion for data.
- a) Mixed
  - b) in-band
  - c) out-of-band
  - d) none of these.
- x) High bandwidth for short duration is needed for
- a) Data traffic
  - b) Voice traffic
  - c) both (a) and (b)
  - d) none of these.
- xi) ISDN B-Channel carries data and services at
- a) 16 kbps
  - b) 32 kbps
  - c) 64 kbps
  - d) 1.544 kbps.
- xii) What does VoIP mean ?
- a) Venison on island pentulia
  - b) Voice over iguana protocol
  - c) Voice over internet protocol
  - d) Voice over internet primary.

**GROUP - B**

**( Short Answer Type Questions )**

Answer any *three* of the following.  $3 \times 5 = 15$

2. a) State the advantages and disadvantages of fiber optic cable.
- b) Explain the operation of 2-wire to 4-wire hybrid system.  $2 + 3$
3. What is the significance of side tone in telephone conversation ?
4. Explain subscriber local loop architecture.
5. Explain associated and non-associated common channel signaling.
6. Explain the differences between circuit switching and packet switching.

**GROUP - C**

**( Long Answer Type Questions )**

Answer any *three* of the following.  $3 \times 15 = 45$

7. a) Define Simplex communication and Half-Duplex and Full-Duplex communication.
- b) Define Trunk lines and subscriber lines.
- c) What is point to point communication ? Mention the disadvantages of the point to point communication. <http://www.makaut.com>
- d) If the number of nodes in point-to-point communication is 770, find out the total number of links required for full connectivity:  
 $3 + 3 + ( 3 + 3 ) + 3$
8. a) Explain the touch tone dial arrangement with proper diagram.
- b) What are the advantages of automatic exchanges over manual exchanges ?
- c) Classify the switching systems Compare the electromechanical and electronic switching systems.
- d) Describe how an uniselector rotary switch can be used as selector hunter.  $3 + 3 + ( 2 + 2 ) + 5$

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9. a) Define GOS and Blocking Probability.  
b) Show that  $GOS = P_B$ , where  $P_B$  is the blocking probability.  
c) During a busy hour, 1400 calls were offered to a group of trunks and 14 calls were lost. The average call duration has 3 minutes. Find (i) Traffic offered, (ii) Traffic carried, (iii) GOS and (iv) The total duration of period of congestion.  
d) Calculate the unavailability of signal and dual processor systems in stored program control system. In SPC systems MTBF = 4000 Hr. and MTTR = 4 Hr. Calculate the unavailability for single and dual processor systems for 30 years.
- $3 + 3 + 4 + (3 + 2)$
10. a) How centralized SPC differs from distributed SPC ?  
b) Assume that during an observation period of 3 hours, a server belonging to a group of 12 in a telecommunication network is occupied for an average of 45 minutes. What is the traffic carried by whole group ?  
c) What is SS7 signaling system ? Explain its protocol.  
d) Explain level-1 and level-2 functions of a SS7 signaling systems.
- $3 + 3 + 4 + 5$
11. Write short notes on any *three* of the following :  $3 \times 5$
- a) Digital PABX
  - b) B-ISDN
  - c) TSI
  - d) ADSL modem
  - e) VoIP.
-

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**MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL**

Paper Code : EE-701

PUID : 07277 (To be mentioned in the main answer script)

**ELECTRIC DRIVES**

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

**GROUP - A**

**( Multiple Choice Type Questions )**

1. Choose the correct alternatives for any ten of the following : 10 × 1 = 10

- i) During lowering of an overhauling load, braking takes place is
  - a) regenerative braking
  - b) dynamic braking
  - c) plugging
  - d) none of these.
- ii) The slip  $s$  for reversal of an induction motor is
  - a)  $s - 1$
  - b)  $1 - s$
  - c)  $2 - s$
  - d)  $1 - 2s$ .

◆◆-7304/7(O)

[ Turn over

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- iii) Starting current of a motor is kept low to
  - a) avoid excessive heating
  - b) safeguard the life of the motor
  - c) reduce the acceleration time .
  - d) reduce the fluctuation in supply voltage.
- iv) Advantage of PWM inverter over square wave inverter is
  - a) higher order harmonics are eliminated
  - b) lower order harmonics are eliminated
  - c) both order harmonics are introduced
  - d) none of the above.
- v) To get speed higher than the base speed of DC shunt motor, the type of control used is
  - a) Armature voltage control
  - b) Field current control
  - c) Armature resistance control
  - d) None of these.
- vi) Motors commonly used for drive in printer is a
  - a) stepper motor
  - b) hysteresis motor
  - c) reluctance motor
  - d) shaded pole motor.
- vii) A single motor which actuates several mechanisms or machines is called a
  - a) Group drive
  - b) Individual drive
  - c) Multimotor drive
  - d) Active drive.

◆◆-7304/7(O)

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viii) Average voltage output from a three-phase full controlled converter is

- a)  $(3V_m/\pi) \cos \alpha$
- b)  $(3V_m/2\pi) \cos \alpha$
- c)  $(3V_m/\pi) (1 + \cos \alpha)$
- d)  $(V_m/3\pi) (1 + \cos \alpha)$

ix) The term 'slip power recovery' is associated with

- a) DC Shunt motor
- b) 3-phase cage rotor induction motor
- c) 3-phase slip ring induction motor
- d) both (b) and (c).

x) A typical active load is

- a) Hoist
- b) Fan
- c) Blower
- d) Pump.

xi) Zone of electric drive below base speed is

- a) constant power zone
- b) constant torque zone
- c) constant voltage zone
- d) none of these.

xii) Frequency of voltage generated by alternator having 4 poles and rotating at 1800 rpm is

- a) 60 Hz
- b) 50 Hz
- c) 120 Hz
- d) 7200 Hz.

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**GROUP - B**

( Short Answer Type Questions )

Answer any three of the following. 3 × 5 = 15

2. What do you mean by electric drive ? What are the various factors that influence the choice of electric drives ?
3. What are the various factors that influence the choice of electric drives ?
4. Explain the methods to reduce the energy loss during starting.
5. Explain briefly the different components of load torque with their torque-speed characteristics.
6. Derive the heating characteristics of an electric motor. Define heating time constant.

**GROUP - C**

( Long Answer Type Questions )

Answer any three of the following. 3 × 15 = 45

7. a) Explain the operation of Ward-Leonard drive system with suitable diagram. Mention the advantages and disadvantages of it.
- b) Why the variable speed applications are dominated by DC drives ?

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c) A 200V, 850 rpm, 150A, separately excited DC motor has an armature resistance of 0.06 Ω. It is fed from a single phase full controlled rectifier with a source voltage of 220V, 50Hz. Assume continuous conduction, calculate

i) firing angle for the rectifier for rated motor torque and 750 rpm and

ii) motor speed for firing angle of 160° at rated torque. <http://www.makaut.com> 6 + 2 + 7

8. a) Discuss closed loop V/f control of induction motor drive mentioning its advantages.

b) What do you mean by self-controlled synchronous motor drive? Explain in detail. 8 + 7

9. a) Explain what you mean by continuous and discontinuous conduction. What are the three intervals present in discontinuous conduction mode of single phase half and fully controlled rectifier?

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b) A 230V, 1200 rpm, 200A, separately excited DC motor has an armature resistance of 0.05Ω. Armature is fed from a three-phase dual converter with circulating current control. The available AC supply has line voltage of 440V, 50Hz. When motor operates in forward motoring mode, the converter A works as rectifier and converter B as inverter. Determine the firing angle for the converters A and B for (a) motoring operation at 90% motor torque and 900 rpm speed and (b) braking operation at 120% of rated motor torque and 1000 rpm speed.

7 + 8

10. a) How does the braking resistance control the dynamic braking torque in dc separately excited motor? How to employ dynamic braking in dc series motors?

b) Describe the operation of a four quadrant chopper fed separately excited DC motor drive. 8 + 7

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11. Write short notes on any *three* of the following : 3 × 5

- a) Three-phase Rectifier fed dc drive
- b) Drive for paper mills
- c) Solar and battery powered drive
- d) Drive for textile mills
- e) Buck-boost method of speed control of dc motor.

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**MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL**

Paper Code : EE-703A

PUID : 07281 ( To be mentioned in the main answer script )

**POWER SYSTEMS-III**

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

**GROUP - A**

**( Multiple Choice Type Questions )**

1. Choose the correct alternatives for any *ten* of the following : 10 × 1 = 10

- i) Which of the following is correct ?
  - a) Load factor = capacity factor × utilization factor
  - b) Utilization factor = capacity factor × load factor
  - c) Capacity factor = load factor / utilization factor
  - d) Capacity factor = load factor × utilization factor.
- ii) The coefficient of reflection for current for an open ended line is
 

a) 1.0	b) 0.5
c) -1.0	d) 0.

\*\* -7511/7(O)

[ Turn over

- iii) For a generating plant
  - a) The utilization factor is always less than 1
  - b) The utilization factor is always more than 1
  - c) The utilization factor may be more may be less than 1
  - d) The utilization factor and load factor are always equal. ✓
- iv) The long term load forecast is needed for
  - a) Planning the addition in generation capacity
  - b) Operation of the plant
  - c) Planning the addition in generation capacity as well as operation of the plant
  - d) ✓ Economic operation of the plant.
- v) The power which must be available even under emergency conditions is known as
  - a) ✓ Spinning reserve
  - b) Cold reserve
  - c) Firm power
  - d) Hot reserve.
- vi) The unit for incremental cost is
  - a) Rs./MWh ✓
  - b) ✓ Rs./MW
  - c) Rs.
  - d) Rs./Hour.
- vii) The principle of incremental cost is used
  - a) To decide the total plant capacity to be operated
  - b) To decide the load allocation between units in operation
  - c) To decide the sequence of adding units
  - d) ✓ All of these. ✓

\*\* -7511/7(O)



- viii) Earth wire on overhead transmission line is provided to protect the line against
- a) Lightning surge
  - b) Switching surge
  - c) Excessive fault voltages
  - d) Corona effect. ✓
- ix) Shunt compensation in an EHV is resorted to
- a) Improve the stability
  - b) Reduce the fault level
  - c) Improve the voltage profile
  - d) As a substitute for synchronous phase modifier. ✓
- x) The advantage of Hydro plant is
- a) Low operating cost
  - b) They can be started and loaded very quickly
  - c) They can be used as base load plants as well as peak load plants
  - d) All of these. ✓

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- xi) A power system needs injection of VARs
- a) At peak load
  - b) At off peak load
  - c) Both at peak load and off peak load ✓
  - d) When the load is neither too high nor too low.
- xii) The changes of reactive power at a bus have a great effect on the voltage magnitude
- a) Of that bus
  - b) Of distant buses
  - c) Of all the buses
  - d) None of these. ✓

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**GROUP - B**

**( Short Answer Type Questions )**

Answer any three of the following. 3 × 5 = 15

2. What is incremental cost criterion ? How the incremental cost calculated ?
3. What are power system transients ? Discuss the sources of over-voltages in power system.
4. Explain reflection coefficient, surge impedance and surge impedance loading.

- 5. State the advantages of static VAR compensation systems over other methods of voltage control.
- 6. Discuss how shunt reactors are used for voltage control in a power system bus.
- 7. Explain the phenomena of lightning and the Travelling waves caused by it on transmission lines.

**GROUP - C**

( Long Answer Type Questions )

Answer any three of the following. 3 x 15 = 45

- 8. a) Obtain the economic operation schedule for the three thermal units delivering a total load of 750 MW without considering generator limit and network losses. The given data for the units are as under : <http://www.makaut.com>  
 Unit 1 :  $F_1(P_1) = 570 + 7.5P_1 + 0.0017P_1^2$  Rs/hr.  
 Unit 2 :  $F_2(P_2) = 380 + 7.8P_2 + 0.002P_2^2$  Rs/hr.  
 Unit 3 :  $F_3(P_3) = 200 + 7.9P_3 + 0.005P_3^2$  Rs/hr.
- b) What do you mean by (i) penalty factor and (ii) incremental transmission loss ? Explain. 8 + 7

- 9. a) Develop a simple computer approach for solving the economic dispatch problem.
- b) In a three-plant system the cost functions are given by :

$$F_1(P_1) = 500 + 7P_1 + 0.002P_1^2$$

$$F_2(P_2) = 400 + 6.5P_2 + 0.003P_2^2$$

$$F_3(P_3) = 200 + 7.2P_3 + 0.006P_3^2$$

And the transmission loss is expressed as

$$P_L = 0.00002P_1^2 + 0.00005P_2^2 + 0.0001P_3^2$$

Assuming total load to be 900 MW. Find the economic dispatch schedule. 8 + 7

- 10. What is passive compensation ? Compare series and shunt compensators. Write short notes on SVC and STATCOM. 3 + 4 + 8
- 11. Describe different types of surge protection devices.

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12. What is Hydro-Thermal Scheduling? What do you mean by long term and short term hydro-thermal scheduling? How do you justify for the cost of water?
13. Write short notes on any *three* of the following : 3 × 5
- a) Necessity of restructuring in electricity market
  - b) FACTS
  - c) Reactive power and voltage control
  - d) Transients in power system
  - e) Environmental aspects and electric power generation.
- 

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**MAULANA ABUL KALAM AZAD UNIVERSITY OF  
TECHNOLOGY, WEST BENGAL**

**Paper Code : EE-402**

**ELECTRICAL & ELECTRONIC  
MEASUREMENT**

*Time Allotted : 3 Hours*

*Full Marks : 70*

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own  
words as far as practicable.*

**GROUP - A**

**( Multiple Choice Type Questions )**

1. Choose the correct alternatives for any ten of the following : 10 × 1 = 10
- i) If the secondary winding of a current transformer is open circuited when connected in line
    - a) low currents are induced in the secondary
    - ~~b) high voltages are induced in the secondary~~
    - c) low voltages are induced in the secondary
    - d) high currents are induced in the secondary.
  - ii) In a Megger, the resistance to be measured is connected
    - ~~a) in series with the control coil~~
    - b) in series with deflecting coil
    - c) in parallel with the deflecting coil
    - d) in parallel with the control coil.

iii) The example of integrating instrument is

- a) moving coil meter
- b) moving iron meter
- c) tangent galvanometer
- d) energy meter.

iv) Which bridge is preferred for measurement of inductance having high  $Q$  factor ?

- a) Maxwell bridge
- b) Hey's bridge
- c) Owen's bridge
- d) DeSauty's bridge.

v) The instrument, which gives the value of the quantity to be measured in term of instrument constant & its deflection, is called the

- a) absolute instrument
- b) secondary instrument
- c) recording instrument
- d) integrating instrument.

vi) When the strain of a wire gauge changes, it results in a change of

- a) pressure
- b) temperature
- c) inductance
- d) resistance.

- vii) Creeping in an energy meter is prevented by
- a) cutting a hole on the disc at one end
  - b) adjustment of shading bands
  - c) cutting two holes on the aluminium disc on opposite ends
  - d) adjustment of the inclined bands on the outer limbs of shunt magnet.
- viii) The readings of which of the following meters are independent of waveform error ?
- a) PMMC
  - b) Moving iron
  - c) Hot wire
  - d) both (a) and (c).
- ix) Maxwell's inductance-capacitance bridge is used to measure <http://www.makaut.com>
- a) inductance of low  $Q$  coils
  - b) inductance of medium  $Q$  coils
  - c) inductance of high  $Q$  coils
  - d) capacitance of lossy capacitor.
- x) Swamping resistance is a resistance which added to the moving coil of a meter to
- a) Reduce the full scale current
  - b) Reduce the temperature error
  - c) Increase the sensitivity
  - d) None of these.

- xi) In electro-dynamometer-type wattmeters, pressure coil inductance produce error which is
- a) constant irrespective of load power factor
  - b) higher low power factors of load
  - c) lower at low power factors of load
  - d) same at lagging and leading power factors of load.

xii) In an AC bridge, there have the following parameters :

Branch AB : Resistance  $R_1$  is in series with inductance  $L_1$

Branch BC : Resistance  $R_2$  is in series with capacitance  $C_2$

Branch CD : Resistance  $R_3$  is in series with inductance  $L_3$

Branch DA : Resistance  $R_4$  is in series with capacitance  $C_4$

An AC supply and a deflector are connected across AC and BD respectively. At balanced condition, what relations should be valid ?

a)  $C_2 C_4 (R_1 R_4 - R_2 R_3) = (L_3 C_4 - L_1 C_2)$  and  
 $C_2 C_4 (R_2 L_3 - R_4 L_1) = 0.00318 (R_3 C_4 - R_1 C_2)$

b)  $L_1 L_3 (R_1 C_4 - R_3 C_2) = (R_2 L_3 - L_1 R_4)$  and  
 $R_2 L_3 (C_2 L_1 - R_1 L_3) = 0.023 (R_4 C_2 - R_2 C_4)$

c)  $L_2 C_4 (R_1 R_2 - R_2 R_4) = (L_1 C_2 - L_3 C_4)$  and  
 $R_2 C_4 (R_1 L_3 - R_3 L_1) = 0.059 (R_2 C_4 - R_4 C_2)$

d) None of these.

**GROUP - B**

**( Short Answer Type Questions )**

Answer any *three* of the following.  $3 \times 5 = 15$

2. Briefly compare between permanent magnet moving coil and permanent magnet moving iron instruments.
3. List out the advantages and disadvantages for both current transformer and potential transformer.  $2 \frac{1}{2} \times 2$
4. Explain the terms with their mathematical expression: accuracy, precision, resolution, speed of response, absolute and relative error.
5. Analyze modified Kelvin double bridge with their proper circuit and phasor diagram.
6. Give a presentation about different usable measuring parameters with their relation and measuring units in electrical engineering as a tabular format.

**GROUP - C**

**( Long Answer Type Questions )**

Answer any *three* of the following.  $3 \times 15 = 45$

7. a) Draw the equivalent circuit & phasor diagram of a current transformer.  
b) A bar-type CT has 400 turns in the secondary winding. The impedance of the secondary circuit is  $(2 + j1.5)$  ohm. With 4A flowing in the secondary MMF is 80A and the iron loss is 1W. Determine ratio and phase-angle errors.  $5 + 5 + 5$



8. a) Explain the functional block diagram of CRO with neat diagram.

b) What is Lissagous figure ? Explain how phase & frequency can be measured using this figures.

c) What are the differences between dual beam CRO & dual trace CRO ? What is the function of delay line ?

$$6 + (2 + 3) + (3 + 1)$$

9. a) Explain with the help of phasor diagram, how unknown inductance can be measured using Anderson's Bridge. <http://www.makaut.com>

b) Justify/correct the statement :

Maxwell's bridge is more suitable than Hay's bridge for measuring self inductance of coils with high  $Q$ .

c) A 230 V single phase watt hour meter records a constant load of 10A for 4 hours at unity power factor. If the meter disc makes 2760 revolutions during this period, what is the meter constant in terms of revolutions per unit ? Calculate the load power factor if the number of revolutions made by the meter is 1104 when recording 5A at 230 V for 6 hours.

$$6 + 3 + 6$$

10. a) Deduce the expression of torque of electro-dynamometer type instrument.
- b) What do you mean by sensitivity of PMMC instrument? Why sensitivity of electro-dynamometer type instrument is low?
- c) Why the scale of moving iron instrument is cramped at lower end?
- d) List the different sources of error in electro-dynamometer type wattmeters?
- e) Why is the compensating coil used in electro-dynamometer type wattmeters?

6 + 3 + 2 + 2 + 2

11. Write short notes on any three of the following : 3 × 5

- a) Digital Multimeter
- b) Rectifier type instrument
- c) Q-meter
- d) Piezoelectric transducer
- e) LVDT.

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MAULANA ABUL KALAM AZAD UNIVERSITY OF  
TECHNOLOGY, WEST BENGAL

Paper Code : EE-503

CONTROL SYSTEM-I

Time Allowed: 3 Hours

Full Marks: 70

The figures in the margin indicate full marks.  
Candidates are required to give their answers in their own words  
as far as practicable.

Group - A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any ten of the following: <http://www.makaut.com> 1×10=10

(i) The characteristic equation of the system is  $s^2 + 2s + 2 = 0$ . The system is

- (a) critically damped (b) under damped  
(c) over damped (d) undamped

(ii) The transfer function  $G(s)$  of a PID controller is

- (a)  $k \left[ 1 + \frac{1}{T_i s} + T_d s \right]$  (b)  $k[1 + T_i s + T_d s]$   
(c)  $k \left[ 1 + \frac{1}{T_i s} + \frac{1}{T_d s} \right]$  (d)  $k \left[ 1 + T_i s + \frac{1}{T_d s} \right]$

(iii) The Bode plot of  $(1 + j\omega T)$  has

- (a) Slope of 20 dB/decade and phase angle  $+\tan^{-1}(\omega T)$   
(b) Slope of -20 dB/decade & phase angle  $+\tan^{-1}(\omega T)$   
(c) Slope of 20 dB/decade & phase angle  $-\tan^{-1}(\omega T)$   
(d) Slope of -40 dB/decade & phase angle  $-\tan^{-1}(\omega T)$

Turn Over

(iv) The frequency of which Nyquist diagram crosses the negative real axis is known as

- (a) gain crossover frequency
- (b) phase crossover frequency
- (c) Natural frequency
- (d) break away point

(v) Addition of zero to the closed loop transfer function <http://www.makaut.com>

- (a) increase rise time
- (b) decrease rise time
- (c) increase overshoot
- (d) has no effect

(vi) The value of  $\xi$  for a second order system is zero. The step response will be

- (a) over damped
- (b) critically damped
- (c) under damped
- (d) sustained oscillatory

(vii) The root loci of a system have three asymptotes. The system can have

- (a) five poles & two zeros
- (b) three poles & one zero
- (c) four poles & two zeros
- (d) six poles & two zeros

(viii) The transfer function of a network is  $\frac{1+0.3s}{2+s}$ . It represents a

- (a) lag network
- (b) lead network
- (c) lead - lag network
- (d) proportional controller

(ix) For eliminating steady state error, the control action required is <http://www.makaut.com>

- (a) Proportional control
- (b) Proportional plus derivative control
- (c) Proportional plus integral control
- (d) Proportional, derivative & integral control

Q. For the transfer function  $G(s) = \frac{1}{s^2 + 2s + 1}$ , the system is

(A)  $s^2 + 2s + 1 = 0$

Q. For the system to remain stable the value of gain K should be

(A) 10

(C) greater than 11 but less than 20

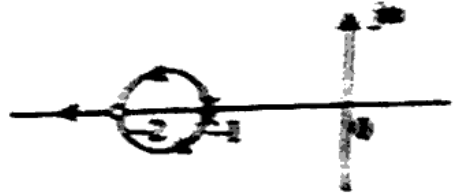
(B) greater than 10 but less than 11

(D) greater than 20 but less than 30

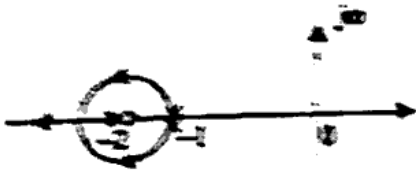
Q. Given a unity feedback system with open-loop transfer function  $G(s) = \frac{K(s+1)}{s^2 + 2s + 1}$ . The root locus plot of the system is <http://www.makaut.com>



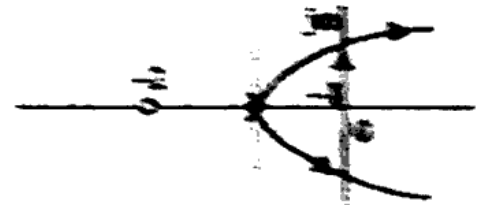
(B)



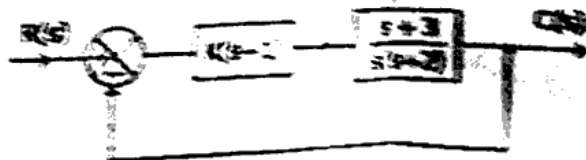
(C)



(D)



Q. For the system in the given figure the characteristic equation is



(A)  $s^4 + 2s^3 + 2s^2 + 1 = 0$

(B)  $s^4 + 2s^3 + 2s^2 + 2s + 1 = 0$

(C)  $s^4 + 2s^3 + 2s^2 + 2s + 2 = 0$

(D)  $s^4 + 2s^3 + 2s^2 + 1 = 0$

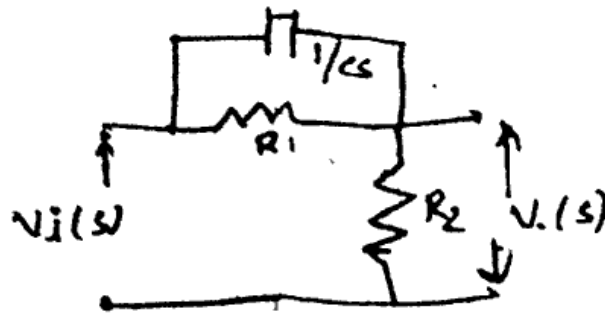
Group - B

(Short Answer Type Questions)

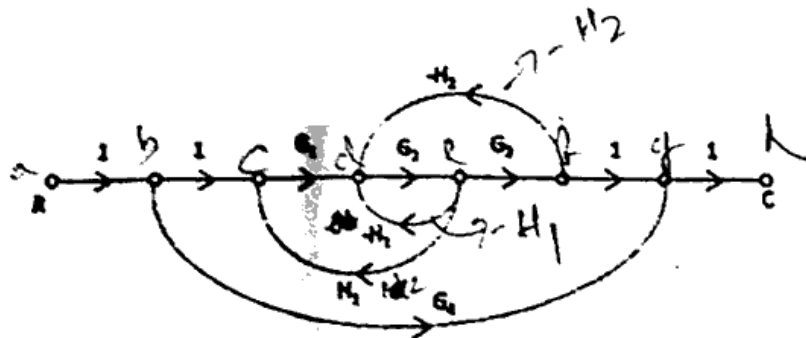
5×3=15

Answer any three of the following.

2. Find the transfer function of the system shown in the figure: <http://www.makaut.com>

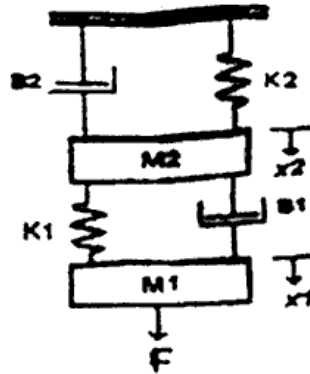


3. Determine the overall transfer function of the signal flow graph given below using Mason's gain formula



4. A unity feedback system has an open loop transfer function  $G(s) = \frac{25}{s(s+8)}$ . Find its damping ratio, natural frequency, rise time, over shoot & time required to reach the peak output. <http://www.makaut.com>

5. Consider the following mechanical translational system.  $F$  denotes force,  $x$  denotes displacement,  $M$  denotes mass,  $B$  denotes friction coefficient and  $K$  denotes spring constant. <http://www.makaut.com>



- (a) Write down the differential equations governing the above system.  
 (b) Draw the corresponding electrical equivalent circuit using force-voltage analogy scheme.

6. A unity feedback system has  $G(s) = \frac{180}{s(s+6)}$  &  $r(t) = 4t$ .

Determine: (a) Steady state error <http://www.makaut.com>

- (b) The value of  $K$  to reduce error by 6%

### Group - C

(Long Answer Type Questions)

Answer any three of the following.

15×3=45

7. (a) The open loop transfer function of a unity feedback control system is given by

$$G(s) = \frac{K}{s(s+1)(s+3)(s+5)}$$

Sketch the root locus plot of the system by finding the following:

- (i) angle of asymptotes, centroid and breakaway points  
 (ii) angle of departure <http://www.makaut.com>  
 (iii) the value of  $K$  and frequency at which the root loci cross the imaginary axis

- (b) Explain what is meant by stability of the system. How can locus plot of a system is used to check stability? 11/10=11

8. (a) What are the advantages of Bode diagram? <http://www.makaut.com>

- (b) Sketch the asymptotic Bode plot for the following open loop transfer function with unit feedback.

$$G(s)H(s) = \frac{20(s+10)}{s(s+20)(s+1)}$$

Calculate the gain and phase cross-over frequency, gain margin and phase margin of the Bode plot. Also, determine the closed loop stability of the system. 3+12=15

9. (a) State and explain Nyquist criterion for studying stability of a control system.

- (b) For a unity feedback system having open loop transfer function

$$G(s) = \frac{K}{s(s^2 + s + 4)}$$

Determine using Nyquist criterion the range of gain 'K' for which the closed loop system will be stable. <http://www.makaut.com> 5-10=15

10. (a) Obtain the equations for the armature controlled DC servomotor and find the transfer function of the DC servomotor.

- (b) Show that the transfer function of a two-phase induction motor can be written in form

$$\frac{\theta_m(s)}{V_z(s)} = \frac{K_m}{s(1 + s\tau_m)}$$

What are the expressions for  $K_m$  and  $\tau_m$  and what are they called? 7+8=15



11. (a) Drive the expression for the time response of a first order system subjected to unit step input.
- (b) The open loop transfer function of a unity feedback system is given by <http://www.makaut.com>

$$G(s) = \frac{K}{s(Ts + 1)}$$

Where  $K$  and  $T$  are positive constants. By how much should the amplifier gain be reduced so that the peak overshoot of unit step response of the system is reduced from 75% to 25%?

- (c) Define position, velocity and acceleration error constants. <http://www.makaut.com>

5+7+3=15



**MAULANA ABUL KALAM AZAD UNIVERSITY OF  
TECHNOLOGY, WEST BENGAL**

**Paper Code : EE-504C**

**MICROPROCESSOR & MICROCONTROLLER**

*Time Allotted:* 3 Hours

*Full Marks:* 70

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words  
as far as practicable.*

*The questions are of equal value.*

**Group – A**

**(Multiple Choice Type Questions)**

1. Choose the correct alternative for *any ten* of the following: <http://www.makaut.com> 1×10=10
- (i) What is the direction of address bus?
- (a) Unidirectional into MP  
(b) Unidirectional out of MP  
(c) Bidirectional  
(d) Mixed direction when lines into MP and some other out of MP
- (ii) The control signal, 'ALE' is sent by 8085 in order to
- (a) inform I/O device that the address is being sent over the AD line.  
(b) achieve separation of address from data.  
(c) inform memory device that the address is being sent over the A/D line.  
(d) inform I/O and memory that the data is being sent over the AD line.
- (iii) A memory system has a total of 8 memory chips, each with 12 address lines and 4 data lines. The total size of the memory system is <http://www.makaut.com>
- (a) 6 kbytes (b) 32 kbytes  
(c) 48 kbytes (d) 64 kbytes

(iv) How many T state is required to execute the instruction MVI M, 32?

- (a) 1 (b) 2  
(c) 5 (d) 10

(v) If the clock frequency is 5MHz then the execution time of the instruction MVI B, 00H is

- (a) 1.8 $\mu$ s (b) 1.4  $\mu$ s  
(c) 1.4 ms (d) 0.4 ms

(vi) When SHLD is executed, number of T-states required are <http://www.makaut.com>

- (a) 10 (b) 14  
(c) 13 (d) 15

(vii) In an 8085 microprocessor, the contents of Accumulator, after the following instructions are executed will become

XRA A  
MVI B F)H  
SUB B

- (a) 01H (b) 0FH  
(c) F0H (d) 10 H

(viii) Which of the following load/retrieve methods best describes a microprocessor stack?

- (a) FIFO (b) LILO  
(c) Ring buffer (d) LIFO

(ix) In which of the following parallel I/O methods the microprocessor assumes that the peripheral is always ready for data transfer? <http://www.makaut.com>

- (a) Simple I/O (b) Strobe I/O  
(c) Handshake I/O (d) DMA controlled I/O

(x) The number of bytes of On-chip ROM contained in 8051 Microcontroller is

- (a) 256 (b) 512  
(c) 1024 (d) 4K

(xi) The size of Instruction queue in 8086  $\mu$ P is

- (a) 4 bytes (b) 6 bytes  
(c) 8 bytes (d) 16 bytes

(xii) Assume Intel 8086 real mode: The offset is 24H. The segment register contains 0B500H. What resulting physical address? <http://www.makaut.com>

- (a) 0B524H (b) 0B5024G  
(c) 24B5H (d) 240b5H

### Group – B

(Short Answer Type Questions)

Answer *any three* of the following.

5×3=15

2. Write an assembly language program supported by 8085 processor to multiply two 8-bit numbers.
3. Draw the timing diagram of the instruction STA 4000H and explain it.
4. Explain the use of when a subroutine is called stack and stack pointer.
5. What are the functions of status and control flags in 8086  $\mu$ P?
6. Explain the following instructions of 8085 processor with suitable examples.
  - (a) SPHL
  - (b) DAA
  - (c) XCHG
  - (d) RAR
  - (e) MOV B, M

### Group – C

(Long Answer Type Questions)

Answer *any three* of the following.

15×3=45

7. (a) Draw a diagram to interface a 6K ROM and a 2K RAM consecutively with microprocessor 8085, starting with ROM interfacing at address 8000H. <http://www.makaut.com>
- (b) Set the interrupt mask so that RST 5.5 is enabled, RST 6.5 is masked and RST 7.5 is enabled.
- (c) Write an assembly language program to check if RST 5.5 is pending. If it is pending, enable RST 5.5 without affecting any other interrupt.

7+4+4=15

8. (a) What do you mean by Mode 0, Mode 1 and Mode 2 operations of 8255 PPI?  
(b) Write the control word format for I/O mode in 8255.  
(c) In mode 1 operation of 8255 PPI, what are the control signals when ports A & B act as output ;  
Discuss the control signals. 6+3+
9. (a) Describe the need for I/O ports in a microcomputer system. <http://www.makaut.com>  
(b) Bring out the merits and demerits of I/O mapped and memory mapped I/O.  
(c) Explain the execution of the DAD D instruction.  
(d) What is the utility of HOLD and HLDA instructions? 5+4+3+
10. (a) With the help of block diagram explain the operation of 8051 microcontroller.  
(b) Write an 8051 assembly language program to add two 16-bit nos.  
(c) How many register banks are there in the RAM of 8051 microcontroller? Explain their functions 7+4+4
11. (a) What are the main functions performed by BIU & EU unit of 8086 microprocessor?  
(b) What are the differences between minimum mode and maximum mode operations of 8086?  
(c) Explain the concept of segmented memory. What are its advantages? <http://www.makaut.com>  
(d) How does the 8086 differentiate between an opcode and data? 5+3+4+3=
-

**CS/B.TECH/EE/EVEN/SEM-6/EE-603/2018-19**



**MAULANA ABUL KALAM AZAD UNIVERSITY OF  
TECHNOLOGY, WEST BENGAL**

**Paper Code : EE-603**

**POWER ELECTRONICS**

*Time Allotted : 3 Hours*

*Full Marks : 70*

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words as far as practicable.*

**GROUP - A**

**( Multiple Choice Type Questions )**

1. Choose the correct alternatives for any *ten* of the following : 10 × 1 = 10

- i) The advantage of an 180° conduction three phase inverter over an 120° conduction three phase inverter is
- a) it needs less number of switches
  - b) there is no paralleling of switches
  - c) devices in series are not simultaneously switches
  - d) load terminals are not left open during switches.

[ Turn over

- ii) A freewheeling diode across inductive load of a phase-controlled converter will provide
- a) quick turn-on of SCR
  - b) slow turn-off of SCR
  - c) reduced utilization factor of transformer
  - d) improved power factor.
- iii) The switching frequency of a MOSFET will be reduced with
- a) an increase in the output impedance of the device
  - b) an increase in the discharge rate of the input capacitance
  - c) an increase in the source resistance
  - d) a decrease in the discharge rate of the input capacitance.
- iv) For a two-quadrant type-A chopper, regenerative braking is
- a) possible at low speeds
  - b) possible at high speeds
  - c) possible at both high and low speeds
  - d) not possible at all.
- v) RC snubber circuit is used to limit rate of
- a) rise of current in SCR
  - b) rise of voltage across SCR
  - c) rise of capacitance of depletion layer
  - d) all of these.

- vi) RC snubber circuit is used to limit rate of
- a) rise of current in SCR
  - b) rise of voltage across SCR
  - c) conduction period
  - d) all of these.
- vii) Cyclo-converter is a
- a) AC to AC converter
  - b) AC to DC converter
  - c) DC to AC converter
  - d) DC to DC converter.
- viii) The range of firing angle in case of RC firing circuit will be <http://www.makaut.com>
- a)  $0^\circ - 90^\circ$
  - b)  $90^\circ - 180^\circ$
  - c)  $0^\circ - 180^\circ$
  - d)  $45^\circ - 90^\circ$
- ix) The output voltage waveform of a three phase square wave inverter contains
- a) only odd harmonics
  - b) both odd and even harmonics
  - c) only even harmonics
  - d) only triplen harmonics.
- x) A 1-phase full bridge VSI has inductor  $L$  as load. For a constant voltage source, the current through the inductor is
- a) square wave
  - b) triangular wave
  - c) sine wave
  - d) pulse wave.



- xi) The cyclo-converters ( CCs ) require
- a) Natural commutation in both step-up and step-down CCs
  - b) Forced commutation in both step-up and step-down CCs
  - c) Forced commutation in step-down CCs
  - d) Forced commutation in step-up CCs.
- xii) Compared BJT, MOSFET has
- a) low switching frequency and low conduction loss
  - b) high switching frequency and low conduction loss
  - c) high switching frequency and high conduction loss
  - d) low switching frequency and high conduction loss.

**GROUP - B**

**( Short Answer Type Questions )**

Answer any *three* of the following.  $3 \times 5 = 15$

2. Describe the effect of source inductance on the output voltage of a single phase full controlled bridge converter.

3. What is snubber circuit ? Why snubber circuit are used in thyristor circuit ? 3 + 2

4. Briefly describe the working of class B chopper with diagram.
5. A thyristor is used to feed a load resistance 8 ohms from a 230 V single phase supply. The ratings of thyristors are repetitive peak current = 200 A,  $(di/dt)_{max} = 40 \text{ A}/\mu\text{s}$  and  $(dv/dt)_{max} = 150 \text{ V}/\mu\text{s}$ . Design a snubber circuit for protection of thyristor.
6. What is cyclo-converter ? Explain the operation of a single phase step-up cyclo-converter.

**GROUP - C**

**( Long Answer Type Questions )**

Answer any *three* of the following.  $3 \times 15 = 45$

7. a) Describe the different modes of operation of thyristor using static V-I characteristics. What is the effect of gate current on this characteristic ?
- b) With two transistor analogy explain how a small gate current can turn-on a SCR.
- c) What is the necessity of connecting SCRs in series ? What are the problem associated with series connection of SCRs ? How are they eliminated ?

5 + 5 + 5

8. a) What is the difference between semi converter and full converter ?
- b) A single-phase fully controlled bridge converter is supplied from 230 V, 50 Hz ac supply and fed to a load which consists of  $R = 20 \Omega$  and large inductance, so that load current is constant and ripple free. If the firing angle is  $30^\circ$  find the
- average and rms of load voltage
  - average and rms of thyristor current
  - average and rms of source current and
  - input power factor. <http://www.makaut.com>
- c) A three-phase half wave-controlled rectifier connected across  $R$  load. Draw the output voltage and phase current waveforms. And also find out the expression of average output voltage at a firing angle of  $\alpha$   $\left[ \text{where, } 0 < \alpha < \frac{\pi}{6} \right]$ . 2 + 8 + 5
9. a) Derive the expression for ripple of inductor current for  $dc$  to  $dc$  buck converter. And also find out the value of duty cycle at which the ripple will be maximum.

- b) Draw and explain a DC-DC boost converter. Derive an expression for average output voltage.
- c) A step-down chopper has a resistive load of  $R = 10 \Omega$  and input voltage of 120 V. when the chopper is turned on, its voltage drop is 2 V. The chopper frequency is 1 KHz. If the duty cycle is 40% determine

- i) Average output voltage
- ii) RMS output voltage
- iii) Efficiency of chopper. 4 + 5 + 6

10. a) State the comparison between voltage source inverter ( VSI ) and current source inverter ( CSI ).

b) Draw the appropriate circuit diagram of three-phase bridge inverter connected to star connected resistive load and explain the operation with the help of phase voltage, line voltage and gate pulse waveforms for  $120^\circ$  conduction mode.

c) A three-phase inverter is supplied from a 580 V source. For a star connected resistive load of  $20 \Omega$  per phase, for  $120^\circ$  conduction. Determine the

- i) rms value of phase voltage
- ii) rms value of thyristor current. 2 + 9 + 4

[ Turn over

CS/B.TECH/EE/EVEN/SEM-6/EE-603/2018-19

11. Write short notes on any *three* of the following :  $3 \times 5$

- a) Turn on methods of thyristor
- b) Complementary commutation
- c) Effect of source inductance for 2-pulse converter
- d) Sinusoidal PWM
- e) Schottkey barrier diode
- f) Two-Quadrant chopper.



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**MAULANA ABUL KALAM AZAD UNIVERSITY OF  
TECHNOLOGY, WEST BENGAL**

**Paper Code : EE-605A**

**DIGITAL SIGNAL PROCESSING**

**Time Allotted : 3 Hours**

**Full Marks : 70**

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own  
words as far as practicable.*

**GROUP - A  
( Multiple Choice Type Questions )**

1. Choose the correct alternatives for any ten of the  
following : 10 × 1 = 10

i) Integration of a Unit Impulse Function  $\delta ( t )$  results  
in

- a) Unit Step Function
- b) Unit Impulse Function
- c) Unit Ramp Function
- d) none of these.



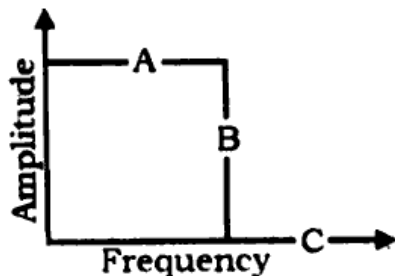
vi) A Blackman window can eliminate ripple in FIR Filters. The trade-off is

- a) larger transition bandwidth
- b) smaller transition bandwidth
- c) a non-linear phase response
- d) possible instability.

vii) The output of two digital filters can be added, Or, the same effect can be achieved by

- a) adding their coefficients
- b) subtracting their coefficients
- c) convolving their coefficients
- d) averaging their coefficients.

viii) The letter A below indicates the filter



- a) stopband
- b) transition band
- c) passband
- d) ripple.





**GROUP - B**  
**( Short Answer Type Questions )**  
Answer any *three* of the following.  $3 \times 5 = 15$

2. If  $u(n)$  denotes a Unit Step signal, obtain the z-transform of  $u(-n)$ .

3. Obtain the convolution sum of the two discrete-time signals given below :

$$x(n) = e^{-n^2}$$

$$h(n) = 3n^2, \text{ for all } n.$$

4. Determine  $x(n)$  by using convolution for,

$$X(z) = \frac{1}{\left(1 - \frac{1}{2z}\right)\left(1 + \frac{2}{4z}\right)}$$

5. A discrete-time system is characterized by the following difference equation : <http://www.makaut.com>

$$y(n) = x(n) + e^a y(n-1)$$

Check this system for BIBO stability.

6. If  $X(z)$  denotes the z-transform of  $x(n)$ , prove that

$$nx(n) = -z \frac{d}{dz} X(z).$$

**GROUP - C**

**( Long Answer Type Questions )**

Answer any *three* of the following.  $3 \times 15 = 45$

7. a) Differentiate between Causal and Non-Causal systems.
- b) What do you mean by BIBO stability of LTI systems ? What is the condition for checking the BIBO stability ?
- c) Show that the signal given by  $x(t) = t^{-1/4} \cdot u(t-1)$  is neither an Energy nor a Power Signal.
- d) Determine the energy of the following sequence :
- $$x(n) = (1/2)^n \text{ for } n \geq 0 \text{ and } 0 \text{ for } n < 0.$$

8. a) In what condition z-transform reduces to Fourier Transform ?
- b) What do you mean by Region of Convergence ( ROC ) of z-transform ? What are the properties of ROC ?
- c) Find the z-transform and the region of convergence ( ROC ) of the discrete time signal given as :

$$x(n) = 2^n u(n) \text{ where } u(n) \text{ denotes a Unit step signal.}$$

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- d) Obtain the convolution of the given discrete-time signal using the convolution property of z-transform :

$$x(n) = n \left(\frac{1}{2}\right)^n u(n) * \left(\frac{1}{4}\right)^{-n} u(-n)$$

2 + 4 + 4 + 5

where \* denotes convolution.

- 9. a) Obtain the Discrete Fourier Transform ( DFT ) of delayed unit impulse  $\delta(n - n_0)$ .

- b) Explain the condition when the results of both Circular and Linear Convolution will be the same.

- c) Determine the circular convolution of the following sequences and compare the results with linear convolution :

$$x(n) = [ 1, 0.5, 1, 0.5, 1, 0.5, 1, 0.5 ]$$

$$h(n) = [ 0, 1, 2, 3 ]$$

- d) Determine the DFT of the four point sequence

$$x(n) = [ 2, 4, 1, 3 ]$$

3 + 2 + 5 + 5

- 10. a) Determine the 8-point DFT of the following sequence :

$$x(n) = [ 0.5, 0, 0.5, 0, 0.5, 0, 0.5, 0 ]$$

0    1    2    3    4    5    6    7

Use in place radix-2 decimation in time FFT algorithm.

b) What are the various FIR Filter design methods ?  
Which window is most commonly used for FIR Filter design and why ?

c) Design the symmetric FIR lowpass filter for which desired frequency response is expressed as :

$$H_d(\omega) = e^{-j\omega\tau} \text{ for } \omega \leq \omega_c \text{ and } 0 \text{ elsewhere.}$$

The length of the filter should be 7 and  $\omega_c = 1$  radians/sample. Make use of Rectangular Window.

6 + 3 + 6

11. Write short notes on any *three* of the following : 3 × 5

- a) Sampling Theorem
- b) Butterfly Structure of FFT
- c) Gibbs Phenomenon
- d) Hilbert Transformer
- e) Window Method of Filter Design.

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**MAULANA ABUL KALAM AZAD UNIVERSITY OF  
TECHNOLOGY, WEST BENGAL**

**Paper Code : ME-503**

**DESIGN OF MACHINE ELEMENTS**

Time Allotted: 3 Hours

Full Marks: 70

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words  
as far as practicable.*

**Group – A**

**(Multiple Choice Type Questions)**

1. Choose the correct alternatives of the following: <http://www.makaut.com> 1×10=10
- (i) When Helical Spring is subjected compression force, the stress induced in the spring is
- (a) ~~tensile stress~~ (b) compressive stress  
(c) shear stress (d) bending stress
- (ii) Spring Index is
- (a) ~~ratio of coil diameter to wire diameter.~~ (b) load required to produce unit deflection.  
(c) its capability of storing energy. (d) indication of quality of spring.
- (iii) The property of a material which enables it to resist fracture due to high impact load is known as
- (a) Elasticity (b) Endurance  
(c) Strength (d) Resilience
- (iv) Two shafts A and B are made of same material. The diameter of shaft B is twice that of shaft A. The ratio of power which can be transmitted by shaft A to shaft B is <http://www.makaut.com>
- (a) 0.5 (b) 0.25  
(c) 0.125 (d) 0.0625
- (v) In V-belt drive, belt touches
- (a) at bottom (b) at sides only  
(c) both at bottom and sides (d) could touch anywhere

- (vi) The Maximum Shear Stress theory is used for <http://www.makaut.com>
- (a) brittle materials  
(b) ductile materials  
(c) plastic materials  
(d) non-ferrous materials
- (vii) In a steam engine, the piston rod is usually connected to the cross-head by means of a
- (a) Knuckle joints  
(b) Universal joint  
(c) Flange coupling  
(d) Cotter joint
- (viii) Oldham's Coupling is used to connect two shafts which —
- (a) have lateral misalignment  
(b) whose axes intersect at a small angle  
(c) are in exact alignment  
(d) is the simplest type of rigid coupling
- (ix) If the tearing efficiency of a riveted joint is 50%, then ratio of diameter of rivet hole to the pitch of rivets is
- (a) 0.20  
(b) 0.30  
(c) 0.50  
(d) 0.60
- (x) In leaf spring the longest leaf is known as <http://www.makaut.com>
- (a) lower leaf  
(b) master leaf  
(c) upper leaf  
(d) none of these

### Group - B

#### (Short Answer Type Questions)

Answer any three of the following questions.

5×3=15

2. It is required to design a flat key for used to connect a pulley to a 50 mm diameter shaft. The standard crosssection of the key is  $14 \times 9 \text{ mm}^2$ . The key is made of commercial steel ( $S_{yt}=S_{yc} = 230 \text{ N/mm}^2$ ) and the factor of safety is 3. Determine the length of the key on the basis of shear and compression considerations, if 15 kW power at 360 rpm is transmitted through the keyed joint.
3. In belt drive, for maximum power transmission, show that one third of the maximum tension in the belt is absorbed as centrifugal tension. <http://www.makaut.com>

4. With the help of a figure, briefly explain how Goodman diagram and Soderberg diagram are used for fatigue design of a component.
5. A rotating bar of steel 45C8 ( $S_{ut} = 630 \text{ N/mm}^2$ ) is subjected to a completely reversed bending stress. The corrected endurance limit of the bar is  $315 \text{ N/mm}^2$ . Calculate the fatigue strength of the bar for a life of 90,000 cycles. <http://www.makaut.com>
6. Two rods are connected by means of a ~~knuckle joint~~. The axial force  $P$  acting on the rods is 25 kN. The rods and the pin are made of plain carbon steel 45C8 ( $S_{yt} = 380 \text{ N/mm}^2$ ) and the factor of safety is 2.5. The yield strength in shear is 57.7% of the yield strength in tension. Calculate
- the diameter of the rods and  $d$ ,
  - the diameter of the pin  $d$

### Group - C

#### (Long Answer Type Questions)

Answer any three of the following questions.

15×3=45

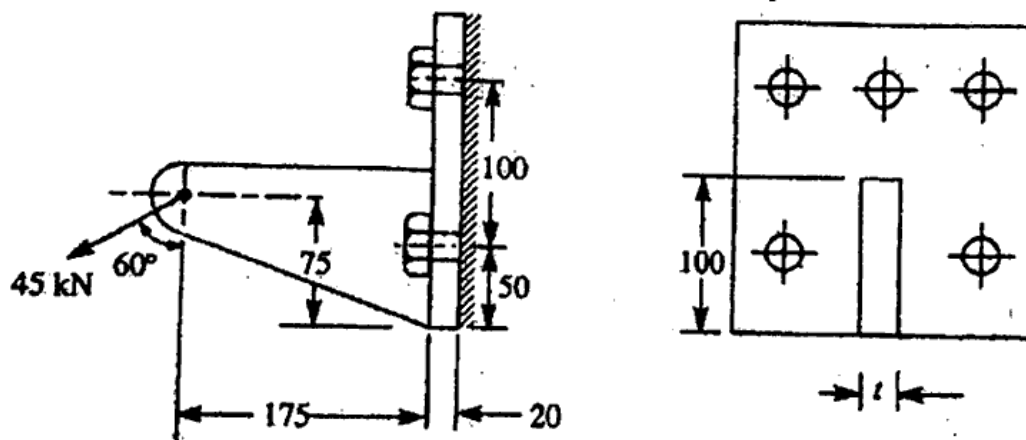
7. A hot rolled steel shaft subjected to bending moment that varies from +500 N-m to -150 N-m, and a twisting moment at the critical section varies from 350 N-m clockwise to 100 N-m anticlockwise. Determine the shaft diameter. Where ultimate strength is 560 MPa, yield strength is 340 MPa, endurance limit is 280 MPa. Load correction factor for variable twisting moment is 0.6 and for variable bending moment is 0.9. Size correction factor is 0.85, surface correction factor is 0.87. Fatigue stress concentration factor is 1.42. Consider 90% reliability and chose the reliability factor accordingly.
8. Design a cotter joint to support a load varying from 30 kN in tension to 30 kN in compression. The material used is carbon steel for which the following allowable stresses may be used. The load is applied statically. <http://www.makaut.com>
- Tensile = Compressive stress = 50 MPa; Shear stress = 35 MPa and Crushing stress = 90 MPa
9. (a) What is an axle? How does it differ from a shaft?
- (b) An overhung shaft carries a pulley of 1000 mm diameter, whose centre is 250 mm from the centre of the nearest bearing. The weight of the pulley is 600N and the angle of lap of the belt may be assumed as  $180^\circ$ . The pulley is driven by a motor, placed below it at an angle of  $45^\circ$ . If the permissible tension in a belt is 2500N and coefficient of friction is 0.3, determine the size of the shaft. Assume the permissible shear stress in the shaft material as 50 MPa. Take Shock and Fatigue factor in torsion and bending as 2 and 1.5 respectively. <http://www.makaut.com> 3+12=15



10. Design a rigid type of flange coupling to connect two shafts. The input shaft transmits 37.5 KW at 180 rpm through the coupling. The service factor is 1.5 for the application. Design torque is 1.5 times the rated torque. Select suitable materials for various parts of the coupling. <http://www.makaut.com>
11. A bracket is fixed to a vertical steel column by means of five standard bolts as shown in the fig. Assume safe working stresses of 70 MPa in tension and 50 MPa in shear.

Determine

- (i) Diameter of the fixing bolts and
- (ii) Thickness of the arm of the bracket.



All dimensions in mm.



**MAULANA ABUL KALAM AZAD UNIVERSITY OF  
TECHNOLOGY, WEST BENGAL**

**Paper Code : ME-504**

**METROLOGY AND MEASUREMENT**

*Time Allotted: 3 Hours*

*Full Marks: 70*

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words  
as far as practicable.*

**Group - A**

**(Multiple Choice Type Questions)**

**1. Choose the correct alternatives of the following: <http://www.makaut.com>**

**1×10=10**

(i) A feeler gauge is used to check

(a) radius

(b) screw pitch

(c) surface roughness

(d) thickness of clearance

(ii) Steel tyres on railway car wheels is an example of

(a) Transition fit

(b) Interference fit

(c) Clearance fit

(d) Running fit

(iii) Time and frequency are the example of <http://www.makaut.com>

(a) Legal metrology field

(b) Fundamental metrology

(c) Industrial metrology

(d) Scientific metrology

(iv) Flow is a phenomenon of <http://www.makaut.com>

(a) surface irregularities

(b) surface layout

(c) surface waviness

(d) surface actual size

(v) 20H7f8 where 'f' denotes

(a) Gauge

(b) Hole

(c) Shaft

(d) Hole and Shaft tolerance

- (vi) In case of hole, GO gauge corresponds to the  
(a) low limit of size. (b) high limit of size.  
(c) base size from the datum. (d) ~~maximum tolerance of hole.~~
- (vii) Two slip gauges in precision measurement are joined by  
(a) Assembling (b) Sliding  
(c) Adhesion (d) ~~Wringing~~
- (viii) Turret is the part of <http://www.makaut.com>  
(a) Micrometer (b) ~~Vernier bevel protector~~  
(c) Taly surf (d) Optical comparator
- (ix) ~~Roughness~~ is a  
(a) ~~Primary texture~~ (b) Secondary texture  
(c) From factor (d) Micro-magnetic error
- (x) Sine bar should not be  
(a) ~~used for measurement of an angle greater than 45°.~~  
(b) ~~used for measurement of an angle less than 45°.~~  
(c) used for measurement of an angle greater than 45° and if at all they have to be used, the sine bar should measure the complement of the angle. <http://www.makaut.com>  
(d) None of these

**Group - B**

**(Short Answer Type Questions)**

Answer any three of the following questions.

5×3=15

2. What is the 'best size' wire? Derive an expression for the same in terms of pitch and angle of thread.
3. What is the difference between hole basis system and shaft basis system for limits and fits?
4. In measuring the diameter  $D$  of a bore by four balls (3 balls of diameter  $D_1$  and the fourth one of diameter  $D_2$ ) placed over them, the height from the flat surface to the top of the ball of diameter  $D_2$  is measured to be  $H$ . Show that

$$D = D_1 + 2\{H(D_1 + D_2) - H^2\}^{\frac{1}{2}}$$

Also show that for the success of the method,  $(2D_1 + D_2)$  should be greater than  $D$  and for accuracy of results, <http://www.makaut.com>

$$D_1 + 0.41D_2 \text{ should be less than } 0.58D.$$

5. A 50 mm diameter shaft is made to rotate in the bush. The tolerances for both shaft and bush are 0.050 mm. Determine the dimension of the shaft and the bush to give a maximum clearance of 0.075 mm with the hole basis system. <http://www.makaut.com>

6. Compute the slip gauge block combinations to build the dimensions: (i) 18.09 (ii) 113.385. The slip gauge set M38 consists of the following:

Range (mm)	Steps (mm)	Pieces
1.005		01
1.01 – 1.09	0.01	09
1.1 – 1.9	0.1	09
1.0 – 9.0	1.0	09
10.0 – 100	10.0	10

**Group – C**

(Long Answer Type Questions)

Answer any three of the following questions.

15×3=45

7. (a) Describe the diaphragm pressure gauge with the help of neat sketch.
- (b) Discuss common thermocouple specifications. <http://www.makaut.com>
- (c) Why sign bar is not used to measure angle more than 45°? ↘
8. (a) Design the general type of GO and NO GO gauge for components having 30H7/f8 fit. Given that
- (i)  $i = 0.453D^{(1/3)} + 0.001D$ ,
  - (ii) Upper deviation of shaft =  $-5.5D^{(0.41)}$
  - (iii) 30mm falls in the diameter step of 18–30 mm
  - (iv) IT7 = 16i
  - (v) IT8 = 25i
  - (vi) Wear allowance = 10% of gauge tolerance <http://www.makaut.com>
- (b) Explain the construction and working of an optical pyrometer with the help of a schematic diagram.

8+7=15

9. (a) Explain with neat sketches the construction and principle of working of a LVDT.

(b) In the measurement of surface roughness heights of 25 successive peaks and troughs were measured from the datum and were  $\{30, 35, 25, 25, 40, 22, 35, 18, 42, 30, 35, 25, 36, 42, 25, 32, 32, 25, 37, 22, 35, 20, 32, 22\}$  and 40. If the sampling length is 25 mm, determine C.L.A and R.M.S value.  $8+7=15$

10. (a) Discuss what you understand by the following terms in connection with surface roughness measurement: <http://www.makaut.com>

- (i) Roughness
- (ii) Waviness
- (iii) Lay
- (iv) Sampling length
- (v) Cut-off length
- (vi) Average leveling depth and Smoothness value (G)

(b) In the measurement of surface roughness, heights of 18 successive peaks and troughs were measured from a datum and were  $\{35, 25, 40, 22, 35, 16, 42, 25, 35, 28, 36, 18, 45, 22, 35, 21, 27, 18\}$  microns. If these measurements were obtained over a length of 18 mm, determine the C.L.A and R.M.S value of the rough surface. <http://www.makaut.com>  $10+5=15$

11. (a) Balls of diameter 30 mm and 15 mm were used to measure the taper of a ring gauge. During inspection, the ball of 30 mm diameter was protruding by 2.5 mm above the top surface of the ring. This surface was located at a height of 50 mm from the top of the 15 mm diameter ball. Calculate the taper angle. <http://www.makaut.com>

(b) A strain gauge is bonded to a beam 0.1m long and has a cross-sectional area 4cm<sup>2</sup>. Young's modulus for steel is 207GN/m<sup>2</sup>. The strain gauge has an unstrained resistance of 240Ω and a gauge factor of 2.2. When a load is applied; the resistance of a gauge changes by 0.013Ω. Calculate the change in length of steel beam and the amount of force applied to the beam.  $7+8=15$



**MAULANA ABUL KALAM AZAD UNIVERSITY OF  
TECHNOLOGY, WEST BENGAL**

**Paper Code : ME-604A**

**AIR CONDITIONING AND REFRIGERATION**

Time Allotted : 3 Hours

Full Marks : 70

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own  
words as far as practicable.*

**GROUP - A**

**( Multiple Choice Type Questions )**

1. Choose the correct alternatives for any *ten* of the following : 10 × 1 = 10
  - i) If  $Q_s$  = sensible heat load and  $Q_L$  = latent heat load, then
    - a)  $SHF = Q_L / (Q_s + Q_L)$
    - b)  $SHF = Q_s / (Q_s + Q_L)$
    - c)  $SHF = Q_s / (Q_s Q_L)$
    - d) none of these.
  - ii) The curved lines on a psychrometric chart indicates
    - a) dry bulb temperature
    - b) wet bulb temperature
    - c) specific humidity
    - d) relative humidity.

- iii) A one ton of refrigerating machine means that
- a) the total weight of machine is one ton
  - b) the quality of refrigerant used is one ton
  - c) one ton of water can be converted into ice
  - d) the refrigerator can produce one ton of ice at  $32^{\circ}\text{F}$  from one ton of water at  $32^{\circ}\text{F}$  in one day.
- iv) While designing the refrigeration system of aircraft prime consideration is that
- a) weight of refrigerant circulated in the system is low
  - b) the weight of refrigeration equipment is low
  - c) system has high COP.
  - d) work consumption per ton of refrigeration is low.
- v) If wet bulb depression is zero, the relative humidity is equal to
- a) 50%
  - b) 25%
  - c) 0%
  - d) 100%.
- vi) The sensible heat factor for auditorium or cinema hall is generally kept as
- a) 0.6
  - b) 0.7
  - c) 0.8
  - d) 0.9.
- vii) Equal friction method is a method to design
- a) evaporator
  - b) condenser
  - c) air distribution duct
  - d) compressor.





**GROUP - B**

( **Short Answer Type Questions** )

Answer any *three* of the following.

3 × 5 = 15

~~2.~~ Prove that relative humidity ( $\phi$ ) is given by

$$\phi = \mu / \{ 1 - (1 - \mu) (P_{vs} / P_t) \}$$
; where  $\mu$  = Degree of saturation,  $P_{vs}$  = saturation pressure of vapour in moist air,  $P_t$  = total pressure of moist air.

~~3~~ Explain any two methods of capacity control in a reciprocating compressor.

~~4~~ Derive an expression for the equivalent diameter of circular duct corresponding to a rectangular duct of side 'a' and 'b' for the same pressure loss per unit length when the velocity of the flowing through both the duct is the same. <http://www.makaut.com>

~~5.~~ What are the various type of ducts arrangements ? Describe one of them with suitable sketches.

6. Describe how sub cooling can be achieved in vapour compression refrigeration system. Also draw the  $p-h$  diagram.

~~7.~~ How do CFCs damage the ozone layer ? What are the desirable properties of refrigerants ?

**GROUP - C**

**( Long Answer Type Questions )**

Answer any *three* of the following.  $3 \times 15 = 45$

8. a) For a corporate office to be air-conditioned, the following conditions are given :

Outdoor condition .....39°C DBT, 20°C WBT

Required comfort condition .....20°C DBT, 60% RH

Seating capacity of office .....1200

Amount of outdoor air supplied .....  $0.3 \text{ m}^2 / \text{mint}$   
per person.

If the required condition is achieved first by adiabatic humidification and then by cooling, determine :

- i) Capacity of the cooling coil in tons
  - ii) Capacity of the humidifier in kg/hr.
- b) What do you mean by By-pass factor for a cooling coil ? 12 + 3
9. a) A reversed heat engine makes 400 kg of ice per hour at  $-8^\circ\text{C}$  from feed water at  $18^\circ\text{C}$ . Assume specific heat of ice as  $2.09 \text{ kJ/kg K}$  and latent heat  $334 \text{ kJ/kg}$ . Determine :
- i) C.O.P. of the engine
  - ii) Least power requires to run the engine
- b) Define an 'air-conditioning system'. Explain the working principle for the system with a neat sketch. 8 + 7

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10. A vapour compressor refrigeration system have following data, refrigeration capacity is 15TR, evaporator temperature is  $-10^{\circ}\text{C}$ , condenser temperature is  $30^{\circ}\text{C}$ , temperature of refrigerant superheated as vapour in evaporator is  $-5^{\circ}\text{C}$ , temperature of refrigerant subcooled as liquid in condenser is  $25^{\circ}\text{C}$ , number of cylinder is 2, stroke is equal to 1.2 times of bore. Speed is 960 rpm.

- a) Find refrigerating effect per Kg
- b) Mass flow rate of refrigerant per min.
- c) Theoretical piston displacement per min.
- d) Power input to the compressor in kW
- e) COP

Take specific heat of liquid is  $0.963 \text{ kJ/KgK}$ , specific heat of vapour is  $0.615 \text{ kJ/KgK}$ . Use the following table :

Temperature ( $^{\circ}\text{C}$ )	Pressure (bar)	$V_g$ ( $\text{m}^3/\text{kg}$ )	$h_f$ (kJ/kg)	$h_g$ (kJ/kg)	$S_f$ (kJ/kgK)	$S_g$ (kJ/kgK)
-10	2.1928	0.07702	190.72	347.96	0.96561	1.5632
30	7.4457	0.02372	229.11	364.96	1.0999	1.5481

11. a) Differentiate between vapour absorption refrigeration system and vapour compression refrigeration system.

b) In a Vapour absorption type refrigerator, heat is supplied to  $\text{NH}_3$  generator by condensing steam at 2 bar and 90% dry. The temperature in the refrigerator is to be maintained at  $-5^\circ\text{C}$ . If the refrigeration load is 20 ton and actual COP is 70% of maximum COP. Calculate

- i) The maximum COP possible and actual COP
- ii) Mass of steam required per hour

You may take the condensing temperature as  $30^\circ\text{C}$ , saturation temperature of steam at a pressure of 2 bar is  $120.2^\circ\text{C}$ , Latent heat of steam at 2 bar is  $2201.6 \text{ kJ/kg}$ .

5 + 10

12. Write short notes on any three of the following : 3 × 5

- a) Capillary tube of a refrigerator
- b) Specific humidity and Relative humidity
- c) Cascade refrigeration system
- d) Psychrometer and Psychrometric process
- e) Defrosting methods.

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**MAULANA ABUL KALAM AZAD UNIVERSITY OF  
TECHNOLOGY, WEST BENGAL**

**Paper Code : ME-601**

**IC ENGINE & GAS TURBINE**

*Time Allotted : 3 Hours*

*Full Marks : 70*

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words as far as practicable.*

**GROUP - A**

**( Multiple Choice Type Questions )**

1. Choose the correct alternatives for the following :

10 × 1 = 10

i) Brake specific fuel consumption is defined as

a) ~~Rate of fuel consumption per hour~~

b) Rate of fuel consumption per km

c) Rate of fuel consumption per bp

d) Rate of fuel consumption per cycle.

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ii) Equivalence ratio is

- a)  $\frac{\text{actual } \frac{F}{A} \text{ ratio}}{\text{stoichiometric } \frac{F}{A} \text{ ratio}}$
- b)  $\frac{\text{stoichiometric } \frac{F}{A} \text{ ratio}}{\text{actual } \frac{F}{A} \text{ ratio}}$
- c)  $\frac{\text{stoichiometric } \frac{F}{A} \text{ ratio}}{\text{actual } \frac{A}{F} \text{ ratio}}$
- d)  $\frac{\text{actual } \frac{A}{F} \text{ ratio}}{\text{stoichiometric } \frac{F}{A} \text{ ratio}}$

iii) Advantage of two-stroke engine is

- a) more uniform torque
- b) lighter flywheel
- c) no valves
- d) all of these.

iv) The volumetric efficiency of a well designed engine is in the range of

- a) 30% to 40%
- b) 40% to 60%
- c) 60% to 70%
- d) 75% to 90%.

v) Thermal efficiency varies

- a) inversely as sfc
- b) directly as sfc
- c) as square of sfc
- d) as square-root of sfc.

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- vi) Stirling engine can be called as
- a) Internal combustion engine
  - b) External combustion engine
  - c) Combination of internal and external combustion engine
  - d) none of these.

- vii) Which is the most effective alternative fuel for IC Engine in rural area ?

- a) CNG
- b) Bio-gas
- c) Alcohol
- d) Hydrogen.

- viii) In a carburetor, idling system is used

- a) to compensate for dilution of charge due to residual gases
- b) for cold starting
- c) for meeting maximum power requirements
- d) for rapid opening of throttle.

- ix) On which factor out of the following volumetric efficiency does not depend ?

- a) Speed of engine
- b) Compression ratio
- c) Clearance volume
- d) Cylinder dimensions.

- x) Piston rings are usually made of

- a) Aluminium alloy
- b) Cast iron
- c) Cast steel
- d) Forged iron.

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**GROUP - B**

**(Short Answer Type Questions )**

Answer any *three* of the following.  $3 \times 5 = 15$

2. Explain briefly about different types of fuel injection nozzles with their merits, drawbacks and figures.
3. Define relative efficiency. Determine the effect of % change in efficiency of Otto cycle having a compression ratio 8 if the specific heat at constant volume increases by 2%. <http://www.makaut.com>
4. An engine develops a brake power of 3.68 kW. Its indicated thermal efficiency is 30%, mechanical efficiency is 80%. Calorific value and specific gravity of the fuel are 42 MJ/kg and 0.875 respectively. Calculate (i) fuel consumption of the engine in kg/h and litres/h. (ii) indicated specific fuel consumption and (iii) brake specific fuel consumption.
5. Derive the expression for maximum net work in a GT cycle in terms of maximum & minimum temperature of the cycle.
6. Explain with sketches the working of a battery ignition system.

**GROUP - C**

**(Long Answer Type Questions )**

Answer any *three* of the following.  $3 \times 15 = 45$

7. a) Briefly explain the major losses in actual cycles. Write the differences between the actual and air-standard cycles.



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b) The compression ratio and expansion ratio of an oil engine working on the dual cycle are 9 and 5 respectively. The initial pressure and temperature of the air are 1 bar and 30°C. The heat liberated at constant pressure is twice the heat liberated at constant volume. The expansion and compression follow the law  $PV^{1.25}$  constant. Determine —

- i) Pressures and temperatures at all salient points
  - ii) Mean effective pressure of the cycle
  - iii) Efficiency of the cycle
  - iv) Power of the engine,
- if working cycles per second is 8, cylinder bore = 250 mm and stroke length = 400 mm.

(3 + 3) + 9

8. a) Write a short note on MORSE test.
- b) The following results were obtained during a test of a 4 stroke, 4 cylinder petrol engine of 100 cc clearance volume, 75 mm bore & 100 mm stroke : B.P. with all cylinders working = 15.6 kW, B.P. with cylinder no. 1 cut out = 11.1 kW, B.P. with cylinder no. 2 cut out = 11.03 kW, B.P. with cylinder no. 3 cut out = 10.88 kW, B.P. with cylinder no. 4 cut out = 10.66 kW, calorific value of the fuel = 45000 kJ/kg.

Calculate (i) mechanical efficiency, (ii) indicated thermal efficiency, (iii) air standard thermal efficiency, (iv) brake thermal efficiency, (v) frictional losses.

5 + 10

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- 9/ a) In a closed cycle gas turbine, air enters the compressor at 1 bar, 27°C where pressure ratio is 6. Maximum temperature in the cycle is limited to 700°C. The isentropic efficiencies of the compressor and the turbine are 0.82 and 0.85 respectively. Find the following :
- (i) the compressor work per kg of air, (ii) the turbine work per kg of air, (iii) the heat supplied per kg of air, (iv) cycle efficiency, (v) the turbine exhaust temperature.

If a regenerator of 90% is employed in the cycle, find the change in cycle efficiency.

- b) For a specified pressure ratio, why does multistage compression with intercooling decrease the compressor work, and multistage expansion with reheating increase the turbine work? 10 + 5

10. a) An unknown hydrocarbon fuel  $C_xH_y$  was allowed to react with air. An analysis was made of a representative sample of the product gases with the following result :

$$CO_2 = 12.1\%, O_2 = 3.8\%, CO = 0.9\%.$$

Determine —

- i) the chemical equation for the actual reaction
- ii) the composition of the fuel
- iii) the air-fuel ratio during the test
- iv) the excess or deficiency of air used.

**CS/B.TECH/ME/EVEN/SEM-6/ME-602/2018-19**



**MAULANA ABUL KALAM AZAD UNIVERSITY OF  
TECHNOLOGY, WEST BENGAL**

**Paper Code : ME-602**

**MACHINING PRINCIPLES AND  
MACHINE TOOLS**

*Time Allotted : 3 Hours*

*Full Marks : 70*

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own  
words as far as practicable.*

**GROUP - A**

**( Multiple Choice Type Questions )**

1. Choose the correct alternatives for any *ten* of the  
following :  $10 \times 1 = 10$

i) A cutting tool can never have its

a) rake angle positive

~~b) rake angle negative~~

c) clearance angle positive

d) clearance angle negative.

ii) In machining Merchant's circle diagram deals with

- a) tool geometry
- b) mechanism of chip formation
- c) mechanics of machining
- d) tool life.

iii) Taylor's tool life equation is expressed by

- a)  $TV^n = C$
- b)  $VT^n = C$
- c)  $(VT)^n = C$
- d)  $VT = C$ .

iv) The angle between orthogonal plane and normal plane of a single point turning tool is

- a)  $\gamma_o$
- b)  $\phi$
- c)  $\lambda$
- d)  $\gamma_n$ .

v) Maximum degrees of freedom in a machine tool is obtained in

- a) a CNC lathe
- b) a CNC milling machine
- c) a machining centre
- d) none of these.

vi) Tool life is most affected by

- a) cutting speed
- b) tool geometry
- c) feed
- d) cutting fluid.

(vii) Both cutting motion and feed motion are imparted to the cutting tools in

- a) lathe
- b) milling machine
- c) drilling machine
- d) shaping machine.

(viii) The size of the grinding wheel is generally specified by

- a) diameter of the wheel
- b) diameter of the spindle
- c) face width of the wheel
- d) ~~all of these.~~

ix) Dividing head is one of the most important attachments used with

- a) drilling machine
- b) ~~milling machine~~
- c) sawing machine
- d) grinding machine.

(x) Machining of cast iron yields — B.

- a) powdered, needle like chip
- b) long continuous chip
- c) ~~fractured chips~~
- d) ~~open coil chips.~~

xi) Chip reduction coefficient is

- a) always less than 1.0
- b) equal to or less than 1.0
- c) more than 1.0
- d) none of these.

xii) Normal rake and orthogonal rake of a turning tool will be same when its

- a)  $\phi = 0^\circ$
- b)  $\lambda = 0^\circ$
- c)  $\phi_1 = 0^\circ$
- d)  $\phi_1 = 90^\circ$

**GROUP - B**

**( Short Answer Type Questions )**

Answer any *three* of the following.  $3 \times 5 = 15$

- 2. Draw a single point turning tool (SPTT), and show on it tool signature parameters in ORS.
- 3. (a) Why are speeds of a machine tool arranged in GP? ✓  
(b) State the use of ray diagram showing an example of it. 2 + 3
- 4. Write a note on various power drives in a CNC lathe mentioning their applicability. 3 + 2

5. a) With a schematic diagram, discuss about the quick return mechanism in shaping.

b) Why is it employed? 4 + 1

6. a) What are the differences between shaping machine and planing machine?

b) State the advantages of CNC machine tools over conventional machine tools. 2 + 3

### GROUP - C

#### ( Long Answer Type Questions )

Answer any *three* of the following. 3 × 15 = 45

7. a) What are the different types of kinematic structure in machine tools?

b) Explain a "C" type kinematic structure with neat sketch. 5 + 10

8. a) What do you mean by tool life? State the main reasons of tool failure.

b) The following equation for tool life is given for a turning operation :

$$VT^{0.13} f^{0.77} d^{0.37} = C.$$

A 60 minute tool life was obtained while cutting at  $V = 30$  m/min,  $f = 0.3$  mm/rev. &  $d = 2.5$  mm.

Determine the change in tool life if the cutting speed, feed & depth of cut are increased by 20% individually & also taken together.

5 + 10

\* In an orthogonal cutting, the following data are available : uncut chip thickness = 0.127 mm, width of cut = 6.35 mm, cutting speed = 2 m/s, rake angle =  $10^\circ$ , cutting force = 567 N, thrust force = 227 N, chip thickness = 0.228 mm. Calculate

- a) The frictional force and normal force.
- b) Mean frictional angle and kinematic co-efficient of friction.
- c) Cutting ratio, shear plane angle.
- d) The shear force and normal force at shear plane.
- e) Direction and magnitude of resultant force.  $5 \times 3$

10. a) Explain Generatrix and Directrix with neat sketch for the following operations (any two) :

- i) Gear Hobbing; ii) Thread milling; iii) Turning.

0 4 + 4

b) Why is Broaching called progressive cutting ?  
Explain Broaching with neat sketch.  $2 + 3$

c) What are the major components of a Planning Machine ?  $2$

11. a) What is speed gear box (SGB) ?

b) What is 'Ray diagram' ?

c) Design 3 feasible open type 'speed flow diagram' and gear layout for a 12 speed gearbox (in 3 stages).

3 + 2 + 4 + 6



2. a) Describe briefly the basic working principle of numerical control of machine tools. State the functions of DPU (data processing unit) and CLU (control loop unit) of numerical control system of machine tools. 7 + 8
- b) Draw schematically the kinematic diagram of a conventional milling machine. 7 + 8
- 

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**MAULANA ABUL KALAM AZAD UNIVERSITY OF  
TECHNOLOGY, WEST BENGAL**

**Paper Code : ME-702**

**PUID : 07188 ( To be mentioned in the main answer script )**

**ADVANCED MANUFACTURING  
TECHNOLOGY**

*Time Allotted : 3 Hours*

*Full Marks : 70*

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own  
words as far as practicable.*

**GROUP - A**

**( Multiple Choice Type Questions )**

1. Choose the correct alternatives for any *ten* of the following : 10 × 1 = 10
- i) Jigs and fixture are used for
- a) mass production
  - b) identical part production
  - c) both (a) and (b)
  - d) none of these.
- ii) Material removal rate in ECM is governed by
- a) Fleming's rule
  - b) Newton's law
  - c) Faraday's law
  - d) None of these.
- iii) Which of the following is the function of jig ?
- a) Holding
  - b) Guiding
  - c) Locating
  - d) All of these.

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- iv) In USM the rate of penetration is dependent on
- a) action of slurry -
  - b) action of the abrasive grains
  - c) reduction of the chemical
  - d) all of these.
- v) Jigs are not used in
- a) Drilling
  - b) Shaping
  - c) Milling
  - d) Taping.
- vi) Flexible manufacturing is economical for ..... production.
- a) batch
  - b) mass
  - c) flow
  - d) none of these.
- vii) Work study is concerned with
- a) improving present method and finding standard time
  - b) motivation of workers
  - c) improving production capability
  - d) improving production planning and control.
- viii) Basic tool in work study is
- a) graph paper
  - b) process chart
  - c) planning chart
  - d) stop watch.
- ix) What does symbol 'O' imply in work study ?
- a) Operation
  - b) Inspection
  - c) Transport
  - d) Delay / temporary storage.
- x) What does symbol D imply in work study ?
- a) Inspection
  - b) Transport
  - c) Delay / temporary storage
  - d) Permanent storage.
- xi) Locating and clamping device made by
- a) low carbon steel
  - b) high carbon steel
  - c) high speed steel
  - d) tool steel.

**GROUP - B**

**( Short Answer Type Questions )**

Answer any *three* of the following. 3 × 5 = 15

2. Write down the advantages and disadvantages wire cut EDM over conventional EDM.
3. Draw the basic electrical waveform and describe spark initiation and MRR mechanism in EDM.
4. Write short notes on the following :
  - i) Cellular Manufacturing Systems
  - ii) Flexible Manufacturing System.  $2\frac{1}{2} + 2\frac{1}{2}$
5. Estimate the Material removal rate ( MRR ) in Abrasive jet machining ( AJM ) of a brittle material with flow strength of 5 GPa. The abrasive flow rate is 3 gm/min, velocity is 205 m/s and density of the abrasive is 4 gm/cc. <http://www.makaut.com>
6. Write the advantages and limitations of Ultrasonic process.

**GROUP - C**

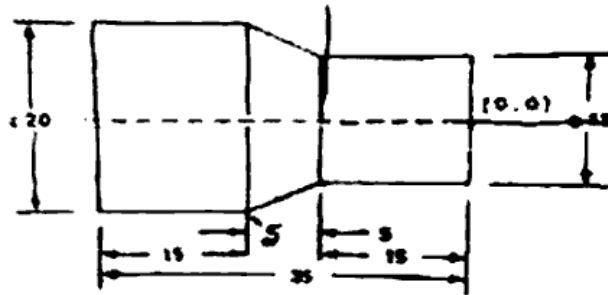
**( Long Answer Type Questions )**

Answer any *three* of the following. 3 × 15 = 45

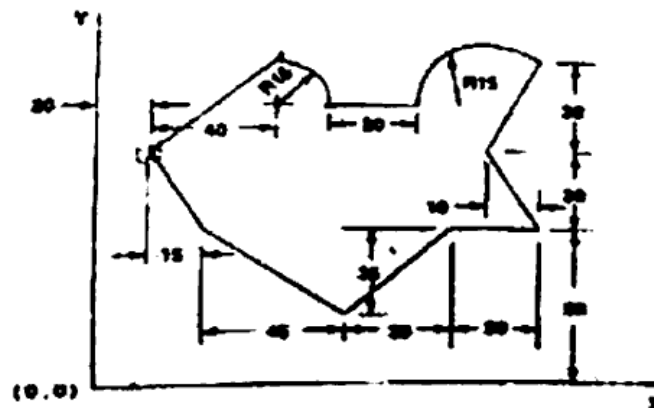
7. Write down the need of non-traditional machining process. Write the difference between traditional and non-traditional machining process. Explain with figure the ultrasonic machining process with its various components.  $3 + 5 + 7$

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8. Describe with neat sketch the working principle of Laser beam machining process. Draw the schematic diagram of Abrasive Jet machining process set up. 8 + 7
9. State the Faraday's law of electrolysis. Describe with figure Electrochemical Machining process. Write the advantages and limitation of it. 2 + 5 + 8
10. Explain with a neat sketch the operation of the canned cycle G81 as per ISO. Write the part programming for the component shown in the figure, keeping maximum depth of cut 2 mm. ( All dimensions are in mm ): 5 + 10



11. Write part programming for the component shown in the figure. Diameter of the milling cutter is 28 mm. ( All dimensions are in mm ).



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**MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL**

Paper Code : ME-701

PUID : 07185 (To be mentioned in the main answer script)

**POWER PLANT ENGINEERING**

Time Allotted : 3 Hours

Full Marks : 70

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words as far as practicable.*

**GROUP - A**

**( Multiple Choice Type Questions )**

1. Choose the correct alternatives for any ten of the following : 10 × 1 = 10

i) Which one of the following is a fire tube boiler ?

a) Babcock-Wilcox boiler

b) Locomotive boiler

c) Stirling boiler

d) Benson boiler.

ii) The circulation ratio in a natural circulation water tube boiler varies between these two values

a) 4 and 20

b) 6 and 25

c) 8 and 35

d) 10 and 40.

iii) In a boiler, feed water supplied per hour is 205 kg while coal fired per hour is 23 kg. Net enthalpy rise per kg of water is 145 KJ for conversion to steam. If the calorific value of coal is 2050 KJ/kg then the boiler efficiency will be

a) 78%

b) 74%

c) 63%

d) 59%.

iv) The function of an economizer in a steam power plant is to

a) increase the temperature of air supplied to a boiler

b) increase the enthalpy of feed water

c) condense the exhaust steam from the turbine

d) heat the fuel before combustion.

v) In a balanced draught steam generator, a slightly negative pressure is maintained in the furnace since

a) the FD fan cannot produced the required draught

b) the ID fan produces more draught than what is required

c) the flue gases cannot leak out from the furnace

d) no air should get out of the furnace.

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vi) Which one of the following sequence indicates the correct order for flue gas flow in the steam power plant layout ?

- a) Economizer, Superheater, Air preheater
- b) Economizer, Air preheater, Superheater
- c) Air preheater, Economizer, Superheater
- d) Superheater, Economizer, Air preheater.

vii) The critical pressure ratio for initially dry saturated steam is

- a) 0.528
- b) 0.546
- c) 0.577
- d) 0.582.

viii) For Parson's reaction turbine, the degree of reaction is

- a) 20%
- b) 30%
- c) 40%
- d) 50%.

ix) The flow through a nozzle is regarded as

- a) Constant volume flow
- b) Constant pressure flow
- c) Isentropic flow
- d) Isothermal flow.

x) The maximum efficiency of a De-Laval turbine is

- a)  $\sin^2 \alpha$
- b)  $\cos^2 \alpha$
- c)  $\tan^2 \alpha$
- d)  $\cot^2 \alpha$ .

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xi) The compounding of turbines is done in order to

- a) reduce speed of rotor
- b) improve efficiency
- c) reduces exit losses
- d) all of these.

xii) De-Laval turbine is

- a) impulse reaction turbine
- b) single rotor impulse turbine
- c) multi rotor impulse turbine
- d) none of these.

**GROUP - B**

**( Short Answer Type Questions )**

Answer any three of the following. 3 x 5 = 15

1. What are the comparative advantages & disadvantages of firetube and watertube boilers ?

2. Differentiate between boiler mountings and boiler accessories. List out the name of boiler mountings and boiler accessories. http://www.makaut.com 2 + 3

3. Derive the condition for maximum efficiency of an Impulse turbine.

4. A steam turbine operates on the Rankine cycle. It receives steam from the boiler at 20 bar and 350°C and it is exhausted into a condenser at 0.08 bar. Condensate is returned back to the boiler by a feed

pump. Assume ideal process, calculate per kg of steam  
(i) heat supplied in the boiler drum, (ii) net work,  
(iii) cycle efficiency.

- 6. Derive the condition for maximum discharge through a Nozzle.

**GROUP - C**

**( Long Answer Type Questions )**

Answer any *three* of the following. 3 x 15 = 45

- 7. a) Write short notes on Locomotive boiler along with neat sketch. 7

- b) A boiler produces 200 kg of dry and saturated steam per hour at 10 bar and feed water is heated by an economiser to a temperature of 110°C. 225 kg of coal of a calorific value of 30100 kJ/kg are fired per hour. If 10% of coal remains unburnt, find the thermal efficiency of the boiler and boiler & grate combined. 8

- a) Derive the expression of chimney height for natural draught. 5

- b) Define the term 'circulation ratio' in a water tube boiler. Write a short note on natural circulation. 5

- c) Draw neat diagrams to represent schematically :

- i) Induced draught
- ii) Forced draught
- iii) Balance draught.

Also give the advantage of forced draught over induced draught. 3+2

- 9. a) Air at 1 MPa and 600°C enters a converging nozzle with a velocity of 150 m/s. Determine the mass flow rate through the nozzle throat area of 50 cm<sup>2</sup> when the back pressure is (i) 0.7 MPa, (ii) 0.4 MPa. 8

- b) State and explain different methods of compounding. 7

- 10. a) A reaction turbine uses 9000 kg of steam per hour. The blades are 20 mm high and discharge angle of both fixed and moving blades is 20°. The steam leaves the fixed blades at 0.32 N/mm<sup>2</sup> with a dryness fraction of 0.95 and a velocity of 120 m/s. Assume the ratio of axial velocity of flow to blade velocity as 0.70 at entry and 0.76 at exit from moving blades. Assumed a tip leakage of 6% of the total steam. Determine —

- i) Speed of turbine in rev/min
- ii) Power developed. 8

- b) Steam enters a group of nozzles of a steam turbine at 12 bar and 220°C and leaves at 1.2 bar. The steam turbine develops 220 kW with a specific steam consumption of 13.5 kg/kwh. If the diameter of nozzle at throat is 7 mm, calculate the number of nozzles. 7



11 Write short notes on any *three* of the following : 3 × 5

- a) Benson Boiler ✓
- b) Circulating Fluidised Bed Combustion (CFBC) ✓
- c) Air pre-heater ✓
- d) Compounding of Impulse Turbine ✓
- e) Components of Nuclear Reactor. ✓

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# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : CE(PC)506 Transportation Engineering

Time Allotted : 3 Hours

Full Marks :70

*The Figures in the margin indicate full marks.*

*Candidate are required to give their answers in their own words as far as practicable*

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) The road traffic consists of how many types of traffic?
- (II) The road foundation for modern highway construction, was developed by which of the following scientists?
  - a) Telford
  - b) Macadam
  - c) Tresguet
  - d) Both Telford and Macadam
- (III) The improper alignment of road will not result in \_\_\_\_\_
  - a) Increase in construction cost
  - b) Increase in maintenance cost
  - c) Increase of population
  - d) Increase in accidents
- (IV) Which is the first stage in traffic engineering studies?
- (V) The PCU (passenger car unit) value for a car on an urban road is  
(A) 0.75 (B) 0.25 (C) 1.0 (D) 1.5
- (VI) At what rate is the temperature applied during the softening point test?
- (VII) On a single lane road with two-way traffic the minimum stopping sight distance is equal to
  - (A) stopping distance
  - (B) two times the stopping distance
  - (C) half the stopping distance
  - (D) three times the stopping distance
- (VIII) Which of the following is not a parameter of traffic stream?
  - a) Speed
  - b) PCU
  - c) Density of traffic
  - d) Flow of traffic
- (IX) After the abrasion test, the sample is passed through which sieve?
- (X) The current highway development works in India are undertaken by?
  - a) NHDP
  - b) CPWD
  - c) PWD
  - d) NHA
- (XI) Obligatory points through which the alignment should not pass are \_\_\_\_\_
  - a) Religious structure and costly structures
  - b) Intermediate towns
  - c) Important cities
  - d) Important places of worship
- (XII) Minimum value of super elevation at any curve in a road is
  - (A) Zero
  - (B) 0.5%
  - (C) Equal to camber
  - (D) 7 %

## Group-B (Short Answer Type Question)

Answer any three of the following

[ 5 x 3 = 15 ]

2. What are obligatory points in highway alignment? [ 5 ]
3. Briefly explain PIEV theory [ 5 ]
4. What are the recommendations of Nagpur Road Conference? [ 5 ]
5. What are the Factors controlling the Highway alignment? [ 5 ]
6. Explain briefly the various stages of work in a new Highway Project. [ 5 ]

**Group-C (Long Answer Type Question)**

Answer any three of the following

[ 15 x 3 = 45 ]

7. (a) The spacing between the contraction joints of a CC pavement is 4.2 m. Find the tensile stress developed in the pavement due to contraction if the coefficient of friction between bottom of the pavement & supporting layer is 1.2 & unit weight of concrete is  $2400 \text{ kg/m}^3$  [ 8 ]  
(b) What do you mean by frictional stress? [ 4 ]  
(c) What is radius of relative stiffness? [ 3 ]
8. (a) A vertical summit curve is to be designed when two grades, + 1/50 and — 1/80 meet on a highway. The stopping sight distance and overtaking sight distance required are 180m and 640m respectively. But due to site conditions the length of vertical curve has to be restricted to a maximum value of 500m if possible. Calculate the length of summit curve needed to fulfill the requirements of  
(i) Stopping sight distance, and  
(ii) Overtaking sight distance or at least intermediate sight distance and discuss the results. [ 8 ]  
(b) Discuss the types of summit curves [ 7 ]
9. (a) Explain maximum & minimum superelevation. [ 8 ]  
(b) Design speed of a road is 65 kmph. The friction coefficient is 0.36 & reaction time is 2.5 sec. Calculate a) Head light sight distance & Intermediate sight distance [ 7 ]
10. (a) Write short notes on design speed & stopping sight distance [ 8 ]  
(b) Find the SSD on a highway at a descending gradient 2.5% for a design speed of 75 kmph. Assume other suitable data as per IRC guidelines. [ 7 ]
11. (a) What is Passenger Car Unit (PCU)? Write down the factors affecting PCU values [ 6 ]  
(b) Discuss different types of traffic signs [ 9 ]

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : CE(PE)705A Railway and Airport Engineering

Time Allotted : 3 Hours

Full Marks :70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) Which is used for servicing and repair of the aircraft?  
(a) Apron (b) Hanger (c) Terminal building (d) Holding apron
- (II) If the Lift off distance is 500m, What is the clear way length in runway?
- (III) What is Tongue rail?
- (IV) The runway of code D as per ICAO classification enables aircraft to operate having using span between  
(a) 15m and 24m (b) 24m and 36m (c) 36m and 52m (d)52m and 65m.
- (V) Which wood is the best wood for wooden sleeper ?
- (VI) What is the the maximum transverse slope of runway pavement?
- (VII) The point upto which the new railway track laid at any time is called  
(a) Rail head (b) Base (c) Terminal (d) Station
- (VIII) The yard where trains and other loads are received, sorted out, trains formed and dispatched onwards are called  
(a) Station yard (b) Marshalling yard (c) Locomotive yard (d) Station yard
- (IX) What is the minimum composite index for wooden sleepers used on Indian railways ?
- (X) The sleeper density of a BG track is  $(n+6)$  in metric units. What is the number of sleepers per 1.024 km of track?
- (XI) A train is hauled by 2-8-2 locomotive with 22.5 tonnes load on each driving axle. Assuming the coefficient of rail-wheel friction to be 0.25, what would be the hauling capacity of the locomotive?
- (XII) For a runway at an elevation of 1000m above MSL and airport reference temperature of 16 degree, what is the rise in temperature to be taken into account as per ICAO ?

## Group-B (Short Answer Type Question)

Answer any three of the following

[ 5 x 3 = 15 ]

2. Briefly explain the term 'Taxiway' with proper diagram. [ 5 ]
3. What are the different types of rails used in India? Explain the functions of a good ballast. [ 5 ]
4. What are the advantages and disadvantages of wooden sleepers? [ 5 ]
5. Describe the basic runway patterns with sketches. [ 5 ]
6. Briefly explain the different failures in rails? [ 5 ]

## Group-C (Long Answer Type Question)

Answer any three of the following

[ 15 x 3 = 45 ]

7. (a) How will you find the length of a transition curve in a railway track? [ 3 ]  
(b) Find the length of a transition curve and draw the offsets at every 15m, given that the design speed of the train on curve is 90 kmph on a BG railway track. [ 12 ]
8. (a) Briefly discuss the corrections which are applied on runway basic length. [ 5 ]  
(b) Find out the required runway length for the airport of reference code 4D located at 450m above mean sea level. The runway effective gradient is 0.5%. The monthly mean of maximum and mean daily temperatures of the hottest month of the year are 27 degree C and 18 degree C respectively. [ 10 ]
9. (a) Write down the difference between principal taxiway and exit taxiway with neat sketch. [ 5 ]  
(b) A taxiway is to be designed for operating sub sonic aircraft 707-320 which has the following characteristics. Determine the turning radius of the taxiway. Wheel base is 17.7m, tread of main loading gear is 6.62m, and turning speed is 40kmph, co- efficient of friction between tyre and pavement surface is 0.13. [ 10 ]

10. (a) What are the basic requirements of an ideal permanent way? [ 5 ]  
(b) What is creep of rails? [ 3 ]  
(c) Briefly explain any two theories of creep with neat sketches. [ 7 ]
11. (a) Give neat sketch of a single runway airport [ 5 ]  
(b) The basic length of a runway is 2000m. The site conditions of the airport are as follows: Elevation is 240m, sum of mean daily temperature in the hottest 30 days month period is 935 degree C and sum of maximum daily temperature during the above period is 1535 degree C. [ 10 ]

Longitudinal gradient of the runway is as follows:

Chainage (m)	0	400	800	1200	1500
Elevation (m)	100	101	98	101.8	102.08

Determine the corrected length of the runway.

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : CE(PC)505 Environmental Engineering - II

Time Allotted : 3 Hours

Full Marks :70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following : [ 1 x 10 = 10 ]
- (I) The growth of huge amounts of algae and other aquatic plants leading to the deterioration of the water quality is called... ?
  - (II) The inclination of bars to the horizontal in a manually cleaned screen is  
a) 30 to 45 b) 15 to 30 c) 45 to 60 d) 60 to 90
  - (III) Pathogens in the sludge may be destroyed by  
a) Mechanical means b) Thermophilic condition c) Chemical treatment d) Aeration
  - (IV) In the two pipe system for the drainage of buildings, the discharge from the waste pipe is disconnected from the drain by using  
a) Gully trap b) Silt trap c) Floor trap d) Grease trap
  - (V) The waste can be classified as hazardous when  
a) It does not cause any mortality. b) It increases mortality. c) It decreases mortality. d) It decomposes itself without any aid.
  - (VI) Theoretical oxygen demand (ThOD) value of 1000 mg/L lactose ( $C_{12}H_{22}O_{11}$ ,  $H_2O$ ) solution is  
a)1000 mg/L b) 1027 mg/L c) 1067 mg/L d) 1097 mg/L
  - (VII) When rainy season is confined to a few months of a year, the preferred sewerage system would be?
  - (VIII) What is lateral sewer?
  - (IX) If we increase the diameter of a sewer, then the self cleansing velocity will \_\_\_\_\_
  - (X) In a BOD determination, 6 ml of wastewater is mixed with 294 ml of dilution water containing 8.4 mg/L of dissolved oxygen. After 5-day incubation at  $20^{\circ}C$ , the dissolved oxygen content of the mixture becomes 5.4 mg/L. The  $BOD_5$  at  $20^{\circ}C$  of the wastewater is
  - (XI) In a city drainage system, having drainage to sewage ratio 20, what will be the peak dry weather flow?
  - (XII) With increase in its duration, the intensity of rainfall will \_\_\_\_\_

## Group-B (Short Answer Type Question)

Answer any three of the following

[ 5 x 3 = 15 ]

2. Discuss the fundamental processes of anaerobic digestion [ 5 ]
3. What will be the provision of freeboard in sewers and sw drains? [ 5 ]
4. a) What is the function of a grit chamber in a wastewater treatment plant? [ 5 ]  
b) Why maximum flow of wastewater is considered for designing of grit chamber?
5. What are the purpose of design period? [ 5 ]
6. Discuss about the presence of sulphur in wastewater. What is crown corrosion? How does it happen? [ 5 ]

## Group-C (Long Answer Type Question)

Answer any three of the following

[ 15 x 3 = 45 ]

7. a) Discuss the different phases of treatment of municipal wastewater. [ 5+10 ]  
b) Draw the complete flow diagram of a conventional activated sludge plant including sludge treatment.
8. Source of sanitary water. [ 15 ]
9. How estimate the design sewage discharge. [ 15 ]

10. a) In determining BOD<sub>5</sub> of a sample, an analyser added 2 ml of a sample to a 300 ml BOD bottle and filled it with dilution water. The analyst also prepared one blank bottle with same dilution water and incubated both at 20°C for 5 days. Dissolved oxygen measurements were made on the samples before and after incubation with the following results: 7 [7+8]

Sample size ml	Initial DO mg/l	Final DO mg/l
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---

2 ml sample	8.1	5.6
Blank Bottle	8.2	8.0

---

What is the BOD<sub>5</sub> for the sample?

- b) The BOD<sub>5</sub> of a wastewater is determined to be 150 mg/L at 20°C. The K<sub>1</sub> value at 20°C is known to be 0.23/day. What would be the BOD<sub>8</sub> value if the tests were run at 15°C?

11. a) What do you mean by activated sludge process with respect to biological treatment of wastewater? What is activated sludge? 5 [5+10]

- b) A conventional activated sludge plant processes 40,000 m<sup>3</sup>/d of wastewater with an influent BOD<sub>5</sub> of 230 mg/l. The total volume of the aeration basin is 8500 m<sup>3</sup> and the MLSS concentration is 3000 mg/l. Calculate aeration period, BOD<sub>5</sub> loading in gm/m<sup>3</sup>/d and in g BOD<sub>5</sub>/d/g of MLSS.

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : CE(PE)704B Advanced Structural Analysis

Time Allotted : 3 Hours

Full Marks :70

*The Figures in the margin indicate full marks.*

*Candidate are required to give their answers in their own words as far as practicable*

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) Which series expansion is used by the Lax-Wendroff Technique?
- (II) For a thin plate residing in x-y plane and loaded along the z-axis, how the normal stress in the x-axis varies across the thickness of the plate?
- (III) Give an example of a ductile material.
- (IV) The stiffness method is also known as \_\_\_\_\_.
- (V) Which is the technique used to overcome the disadvantages of the Lax-Wendroff technique?
- (VI) For a thin plate what is the value of normal stress in the direction of the plate thickness?
- (VII) How many rotations are possible in case of 3 dimensional frame/beam?
- (VIII) What is the finite difference method used for?
- (IX) As per Kirchhoff theory, what is the expression for shear strain at distance z from the mid-surface of a plate?
- (X) What is ductility?
- (XI) Relaxation techniques are used to ensure \_\_\_\_\_.
- (XII) As per Kirchhoff theory write down the expression for horizontal strain along the x-axis at distance z from the mid-surface of a plate.

## Group-B (Short Answer Type Question)

Answer any three of the following

[ 5 x 3 = 15 ]

2. What's The Difference Between FEM, FDM, and FVM? [ 5 ]
3. Write down the strain-displacement relations for Kirchhoff plate theory [ 5 ]
4. a) What happens if an element has more nodes than necessary? Will it have an impact on the solution? [ 5 ]  
b) What are the various types of elements that can be used in finite element analysis? Which one would you prefer over others in certain situations?
5. Write down the stress-strain relations for a Kirchhoff thin plate. [ 5 ]
6. Write down the properties of a stiffness matrix and explain it with the help of a suitable example. [ 5 ]

## Group-C (Long Answer Type Question)

Answer any three of the following

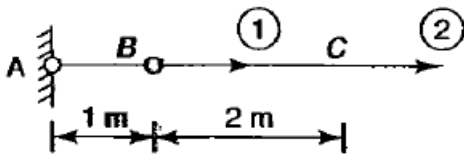
[ 15 x 3 = 45 ]

7. A circular plate of radius  $a$  is clamped at the edge and subjected to a uniform pressure of intensity  $p_0$ . Derive and expression for the surface deflection. [ 15 ]
8. (a) Explain in details the Finite Difference Method along with the proper equations that are necessary for formulation of the same. [ 7 ]  
(b) How many different approaches are there for formulating an FEM problem? Explain them individually. [ 8 ]



9. Develop the stiffness matrix for prismatic member AB with reference to the coordinates shown in the figure for the following support conditions. [ 15 ]

- i) hinged at A and roller support at B
- ii) fixed at A and B
- iii) fixed support at A and roller support at B



10. (a) Derive 4th order derivatives in finite difference technique. [ 6 ]  
(b) How many iterative methods are there? Explain each of them individually. [ 9 ]
11. (a) What are the assumptions of small-deformation theory of thin shell? [ 5 ]  
(b) Derive the expression for stress resultants of a thin shell with necessary sketches. [ 10 ]

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : CE(PC)504 Soil Mechanics - II

Time Allotted : 3 Hours

Full Marks :70

*The Figures in the margin indicate full marks.*

*Candidate are required to give their answers in their own words as far as practicable*

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) Maximum bearing capacity can be expected from -----rock.
- (II) Large settlement in clayey soil will occur when water table -----
- (III) Settlement of raft foundation in comparison to individual footing for same soil pressure is  
a) more b) less c) equal d) none of these
- (IV) The unit of coefficient of consolidation is -----
- (V) The maximum dry density up to which any soil can be compacted depends upon ----- and amount of energy.
- (VI) Total lateral earth pressure is proportional to -----of depth of soil.
- (VII) The bearing capacity of a soil may be improved by -----depth of foundation.
- (VIII) Settlement due to creep in soils is accidental on -----  
a) primary consolidation b) secondary consolidation c) initial settlement d) compaction settlement
- (IX) Write down the formula for Taylor's stability number.
- (X) The coefficient of consolidation of a soil is affected by -----&-----
- (XI) To get better strength and stability , the fine grained soils are compacted as ----- of OMC
- (XII) The effect of cohesion on a soil is to reduce ----- intensity but increase ----- intensity

## Group-B (Short Answer Type Question)

*Answer any three of the following*

[ 5 x 3 = 15 ]

2. Define the factors which affect the compaction process. [ 5 ]
3. A wall with smooth vertical back retains a mass of cohesionless soil of 10m height, has horizontal backfill. The backfill soil weighs 21 KN/m<sup>3</sup> and has an angle of internal friction 30<sup>0</sup>. Determine the total active earth pressure and its point of application. [ 5 ]
4. In a laboratory compaction test on soil the results are found as specific gravity = 2.65, maximum dry density = 1.82 gm/cc, water content = 17%. Determine degree of saturation and air content. [ 5 ]
5. A retaining wall 4m high supports backfill of  $C = 20 \text{ KN/m}^2$ ,  $\phi = 30^\circ$ ,  $\gamma = 20 \text{ KN/m}^3$  with horizontal top surface. The backfill carries a surcharge of 20 KN/m<sup>2</sup>. If the wall pushed towards backfill then determine total earth pressure of backfill. [ 5 ]
6. Calculate the factor of safety with respect to cohesion of a clay slope laid at 1 in 2 to a height of 10m, if angle of internal friction  $\phi = 10^\circ$ ,  $C = 25 \text{ KN/m}^2$  and  $\gamma = 19 \text{ KN/m}^3$ . Also determine the critical height of slope in this soil. Consider for  $\phi = 10^\circ$ , if  $i=30^\circ$  then  $S_n = 0.075$  and if  $i=15^\circ$  then  $S_n = 0.023$  [ 5 ]

## Group-C (Long Answer Type Question)

*Answer any three of the following*

[ 15 x 3 = 45 ]

7. A retaining wall 6 m high has a smooth vertical back. The horizontal backfill surface is level with top of wall carries a uniformly distributed surcharge of 2.5 T/m<sup>2</sup>. The sandy backfill having unit weight 1.7 gm/cc and angle of internal friction 40<sup>0</sup> and top 2 m is unit weight 1.6 gm/cc and angle of internal friction 30<sup>0</sup>. Determine total active earth pressure and it's point of application on retaining wall. [ 12 +3 ]

8. A retaining wall 2 m in height has a smooth vertical surface. The backfill has a horizontal levelled surface with at top of retaining wall. The density of backfill is  $1.8 \text{ T/m}^2$ , shearing resistance angle is  $30^\circ$  and cohesion is zero. A uniformly distributed surcharge load of  $3\text{T/m}^2$  intensity is acting on the backfill. a) Determine the magnitude and point of application of total active earth pressure. b) If during rainy season, water table rises behind the wall to a height of 1 m above base of wall, determine the effect on value of active earth pressure if there is no change in angle of shearing resistance. Submerged unit weight of backfill is  $1.25 \text{ T/m}^2$  [7+8]
9. Mass of mould + mass of wet soil (gm) 2925 3095 3150 3125 3070 [10+5]  
 Water Content (%) 10.0 12.0 14.3 16.1 18.2  
 Volume of mould = 1000 ml , Mass of mould = 1000gm.  $G = 2.7$   
 Define compaction curve showing the optimum moisture content and maximum dry density. Also plot zero air void line.
10. a) A vertical wall, 5 m high supports a saturated cohesive backfill with horizontal surface. The top 3 m of backfill weighs  $1.76 \text{ gm/cc}$  and has an apparent cohesion of  $0.15 \text{ kg/cm}^2$ . Next 2 m backfill weighs  $1.92 \text{ gm/cc}$  and cohesion  $0.2 \text{ kg/cm}^2$ . i) determine depth of tensile crack if it occurs behind the wall ii) Also determine active earth pressure after tensile crack occurrence and it's point of application for top 3 m soil. [8+7]  
 b) A vertical retaining wall of height 5 m supports a horizontal backfill. The backfill soil 2 m from G.L. consist of clay ( $C = 10 \text{ KN/m}^2$ ,  $\phi = 20^\circ$ ,  $\gamma = 17 \text{ KN/m}^3$ ) and rest 3 m consist of sand ( $\phi = 30^\circ$ ,  $\gamma = 16 \text{ KN/m}^3$ ). Here tensile crack occurs up to 2 m from top. Determine total active earth pressure and it's point of application.
11. A rectangular footing of size  $1.8 \text{ m} \times 3 \text{ m}$  has to transmit the load of a column at depth of 1.5 m. The soil properties are  $\eta = 40\%$ ,  $G = 2.67$ ,  $w = 15\%$ ,  $C = 8 \text{ KN/m}^2$  and  $\phi = 32.5^\circ$ . Determine safe load by using IS code method. [15]

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : CE(PE)703A Air and Noise Pollution and Control

Time Allotted : 3 Hours

Full Marks :70

*The Figures in the margin indicate full marks.*

*Candidate are required to give their answers in their own words as far as practicable*

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) When the vibrating object moves backwards, it creates a region of low pressure called-----
- (II) What is the relations among  $L_i$ ,  $L_p$  and  $L_w$  with reference to different expressions to sound level?
- (III) Blue baby syndrome is caused by-----
- (IV) What is the recommended maximum noise level in a residential area in night time (as per CPCB)?
- (V) Ozone Depletion is a consequence of:
  - a. Greenhouse Effect
  - b. Emissions of CFC
  - c. Emissions of VOCs
  - d. Emissions of  $NO_x$
- (VI) What do you mean by Albedo?
- (VII) When the environmental lapse rate is greater than the dry adiabatic lapse rate, then the atmosphere is said as-----
- (VIII) What will be the plume pattern when the atmosphere is unstable?
- (IX) One Dobson unit is equal to-----
- (X) Which component of an electrostatic precipitator can remove gases like sulphur dioxide through a spray of water or lime?
- (XI) When the air is warmed by compression as it descends in a high pressure system and achieves temperature higher than that of the air underneath, the inversion is called-----
- (XII) A vibrating body produces sound. However, no sound is heard when a simple pendulum oscillates in air why?

## Group-B (Short Answer Type Question)

Answer any three of the following

[ 5 x 3 = 15 ]

2. Define primary and secondary pollutants. Give examples. [ 5 ]
3. What to you mean by global warming? Define Acid Rain. [ 5 ]
4. Discuss what you know about the audible range of sound intensity. [ 5 ]
5. Define sound power. Establish the relation between sound power and sound intensity. [ 5 ]
6. An air parcel having  $40^\circ$  temperature moves from ground level to 500m elevation in dry air following the adiabatic lapse rate. Calculate the temperature of air parcel at 500m elevation. [ 5 ]

## Group-C (Long Answer Type Question)

Answer any three of the following

[ 15 x 3 = 45 ]

7. a) Define Lapse Rate. What do you mean by inversion and its types? [ 5+5+5 ]
  - b) Define Plume and Plume Rise.
  - c) List out the types of Plume Pattern? Define Coning.

8. a) Why is "Conditional Stability" so named? [5+7+3]  
b) With the help of a sketch show the co-ordinate system of Gaussian model.  
c) Find the Cartesian (x, y, z) co-ordinates of the following points: (need not to be shown in the Coordinate system)  
i) The stack tip,  
ii) The point representing a ground level source with negligible effective height,  
iii) Any point on plume centerline,
9. (a) Discuss the Global Warming- pollutants, their sources? [5]  
(b) Enumerate the causes, and effect of ozone layer depletion? [10]
10. (a) Mention the relationship of i) period and frequency b) wavelength and frequency. [2]  
(b) Write down the expression to quantify the sound with various frequencies in root mean square sound pressure ( $P_{rms}$ ) over a measurement time T. [3]  
(c) If a sound source has a pressure of 2000  $\mu$ Pa at 10 m distance, compute [10]  
(i) the sound pressure level in dB  
(ii) the sound intensity in Watt/m<sup>2</sup>  
(iii) the sound power in Watt
11. (a) An industry utilises 0.3 Ml of oil fuel per month. It has also been estimated that for every 1 Ml of fuel oil burnt in the factory, per year, the quantities of various pollutants emitted are given as: [10]  
particulate matter = 2.9t/yr  
 $SO_2 = 60t/yr$   
 $NO_x = 8t/yr$   
 $HC = 0.4t/yr$   
 $CO = 0.5t/yr$   
Calculate the height of the chimney required to be provided for safe dispersion of the pollutants.0  
(b) What do you mean by Negative lapse rate and inversion? [5]

\*\*\* END OF PAPER \*\*\*



**MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL**

Paper Code : CE(PC)503 Structural Analysis - I

Time Allotted : 3 Hours

Full Marks :70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

**Group-A (Very Short Answer Type Question)**

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

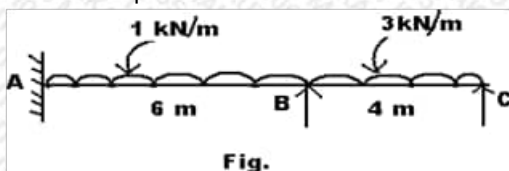
- (I) The ratio of the maximum deflections of a simply supported beam with a central load W and of a cantilever of same length and with a load W at its free end, is
  - (II) A concentrated load P is supported by the free end of a quadrantal ring AB whose end B is fixed. The ratio of the vertical to horizontal deflections of the end A, is \_\_\_\_\_
  - (III) The total strain energy of a beam of length L, having moment of inertia of its section I, when subjected to a bending moment M, is \_\_\_\_\_
  - (IV) A truss containing j joints and m members, will be a simple truss if
  - (V) The ratio of the deflections of the free end of a cantilever due to an isolated load at 1/3rd and 2/3rd of the span, is
  - (VI) The equivalent length of a column of length L, having both the ends hinged, is
  - (VII) Principal planes are subjected to \_\_\_\_\_ only.
  - (VIII) Hoop strain of the walls of a cylinder due to liquid is
  - (IX) The ratio of maximum shear stress to average shear stress of a circular beam, is
  - (X) The general expression for the B.M. of a beam of length l is the beam carries
- $$M = \frac{wl}{2} x - \frac{wx^2}{2}$$
- (XI) The point of contraflexure is the point where \_\_\_\_\_
  - (XII) In plastic analysis, the shape factor for a circular section, is \_\_\_\_\_

**Group-B (Short Answer Type Question)**

Answer any three of the following

[ 5 x 3 = 15 ]

- 2. What is degree of kinematic indeterminacy? [ 5 ]
- 3. Write down the Castigliano's first theorem. [ 5 ]
- 4. What is meant by absolute maximum bending moment in a beam? [ 5 ]
- 5. What is the significance of unit load method? [ 5 ]
- 6. Write the equation for final moments in moment distribution method. [ 5 ]

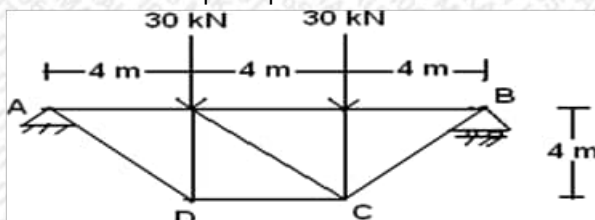


**Group-C (Long Answer Type Question)**

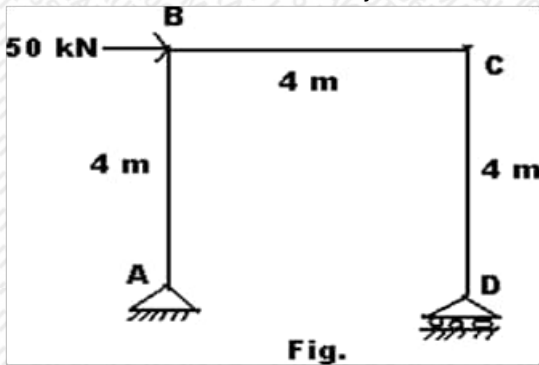
Answer any three of the following

[ 15 x 3 = 45 ]

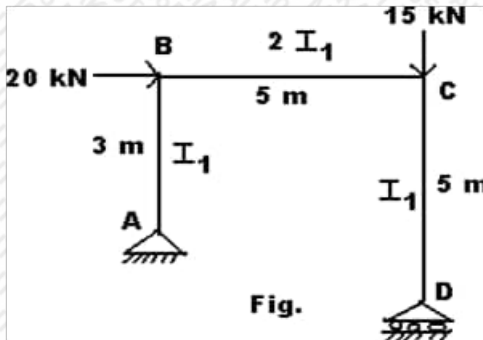
- 7. The steel truss shown in figure is anchored at A and supported on rollers at B. if the truss is so designed that, under the given loading, all tension members are stressed to 110 N per square mm and all compression members to 85 N per square mm. Find the vertical deflection of the point C. Take E = 2 x 10<sup>5</sup> N per square mm. [ 15 ]



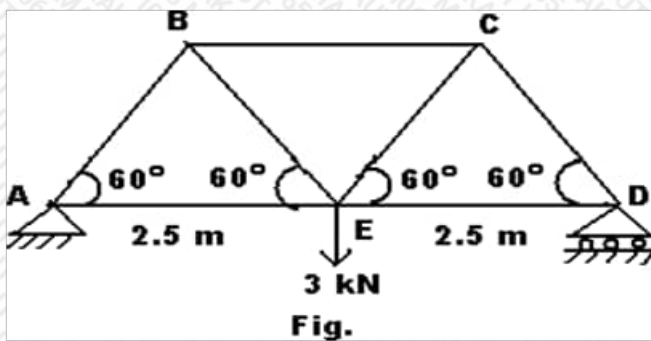
8. Find the horizontal deflection of joint 'B' in the frame shown in figure. Take  $E = 2 \times 10^5 \text{ MPa}$  and  $I = 3.5 \times 10^8 \text{ mm}^4$ . [ 15 ]



9. Determine the horizontal displacement at the roller support of the rigid jointed frame shown in figure. Take  $E = 2 \times 10^5 \text{ MPa}$  and  $I_1 = 30 \times 10^8 \text{ mm}^4$ . [ 15 ]



10. Determine the vertical deflection of joint E for the Warren truss shown in figure. Take  $A = 645 \text{ mm}^2$  and  $E = 200 \text{ kN/mm}^2$  for all the members [ 15 ]



11. Draw the ILD for the forces in members U2L2 and U2L3 of the truss shown in figure.

[ 15 ]

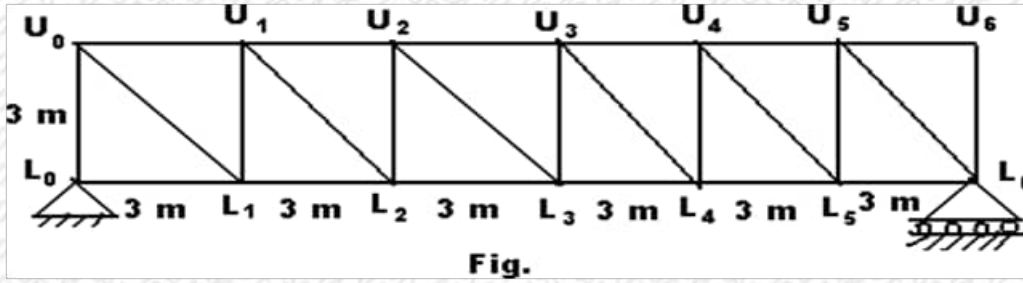


Fig.

\*\*\* END OF PAPER \*\*\*





# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : CE(PC)502 Engineering Hydrology

Time Allotted : 3 Hours

Full Marks :70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) The stage of river carrying a discharge of  $Q$  m<sup>3</sup>/sec at a point is 10 m and slope of water surface is (1/4000). The discharge of a flood at the same point and same stage of 10 m with a water surface slope of (1/1000) will be
- (II) What is an IUH?
- (III) For an annual flood series arranged in decreasing order of magnitude, the return period for a magnitude listed at position  $m$  in a total of  $N$  entries is \_\_\_\_\_
- (IV) What is the Muskingum method ?
- (V) Symon's rain gauge is a type of \_\_\_\_\_
- (VI) What is an anticyclone?
- (VII) Which type of rain gauge is used for measuring rains in remote, hilly inaccessible areas?
- (VIII) A 6h rainfall of 6 cm at a place A was found to have a return period of 40 years. What is the probability that as a 6h rainfall of this or larger magnitude will occur at least once in 20 successive years ?
- (IX) What is a Thiessen polygon ?
- (X) What is Potential evapotranspiration ?
- (XI) A well having size 7.70 m x 4.65 m in lateritic soil has its normal water level 5.08 m below ground level. After pumping for 1.5 hours, the water level depressed to 5.93 m and pumping was stopped. The water level after 4 hours from time alter pumping stopped is 5.68 m. the specific capacity of the well is:
- (XII) The point of inflection on the recession limb of a hydrograph represents: \_\_\_\_\_

## Group-B (Short Answer Type Question)

Answer any three of the following

[ 5 x 3 = 15 ]

2. A catchment has four sub-areas. The annual precipitation and evaporation from each of the areas are given in table below: [ 5 ]

Assume that there is no change in the groundwater storage on an annual basis. Calculate for the whole catchment the values of annual average (i) precipitation and (ii) evaporation. What are the annual runoff coefficients for the sub-areas and for the total catchment taken as a whole.

Sub-area	Area (Mm <sup>2</sup> )	Annual Precipitation (mm)	Annual evaporation (mm)
A	10.7	1030	530
B	3.0	830	438
C	8.2	900	430
D	17.0	1300	600

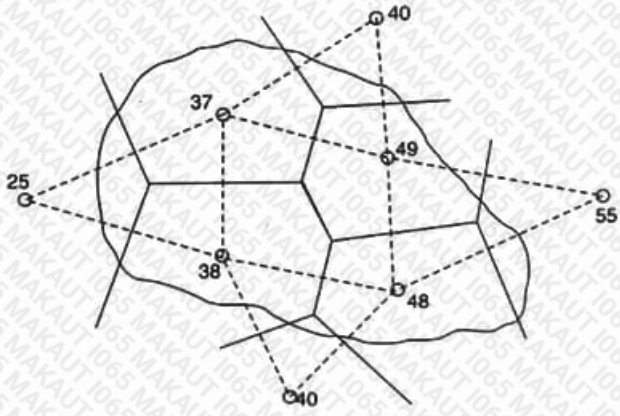
3. What are the assumptions made in unit hydrograph theory? [ 5 ]
4. Define  $w$ -index and  $\phi$ -index. [ 5 ]
5. The total rainfall in a catchment of area 1000 km<sup>2</sup>, during a 6-h storm, is 19 cm. The surface runoff due to this storm computed from triangular direct runoff hydrograph is  $1 \times 10^8$  m<sup>3</sup>. Determine the  $\phi$  index for this storm. [ 5 ]
6. A bridge has an expected life of 25 years and is designed for a flood magnitude of return period 100 years. (a) what is the risk of this hydrologic design? (b) if a 10% risk is acceptable, what return period will have to be adopted? [ 5 ]

## Group-C (Long Answer Type Question)

Answer any three of the following

[ 15 x 3 = 45 ]

7. Describe the various methods of computing average rainfall over a basin. Discuss the merits and demerits of each one. [5+5+5]
8. Compute the average depth of rainfall for catchment shown in figure with an area of 200 km<sup>2</sup>, using all the three methods. The rainfall amounts are indicated in mm at the respective gauge sites. Also compute the volume of rain water in m<sup>3</sup> received by the catchment area in each case. [5+5+5]



Figure

9. For a river, the estimated flood peaks for two return periods by the use of Gumbel's method, are given below [15]

Returns period (years)	Peak flood (m <sup>3</sup> /s)
100	485
50	445

What flood discharge in this river will have return period of 100 years.

10. (a) The inflow hydrograph readings for a stream reach in m<sup>3</sup>/sec at 12 hour intervals are as follows: 42, 45, 88, 272, 342, 288, 240, 198, 162, 133, 110, 90, 79, 68, 61, 56, 54, 51, 45, 45 and 42. The Muskingum coefficients for the stream reach are k=36 hr and x=0.15. determine the attenuation in peak flow discharge. [8]
- (b) Also determine the time of peak outflow [7]
11. (a) On the basis of isopluvial maps, the 50 year-24 hr maximum rainfall at Bangalore is found to be 16 cm. determine the probability of 24 hr rainfall of magnitude equal to or greater than 16 cm occurring at bangalore: [5]  
At least once in 10 successive years.
- (b) Two times in 10 successive years. [5]
- (c) Once in 10 successive years. [5]

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : CE(PE)702A Prestressed Concrete

Time Allotted : 3 Hours

Full Marks :70

*The Figures in the margin indicate full marks.*

*Candidate are required to give their answers in their own words as far as practicable*

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) Prestressed concrete electric poles are generally prestressed with \_\_\_\_\_
- (II) The grade of concrete for prestressed members should be in the range of \_\_\_\_\_
- (III) Torsional shear stresses developed in prestressed members in inversely proportional to the \_\_\_\_\_
- (IV) In the anchorage zone of a post tensioned beam splitting cracks due to bursting tensions developed in the direction of \_\_\_\_\_
- (V) Prestressing a continuous concrete beam results in \_\_\_\_\_
- (VI) In composite construction prestressed elements are used advantageously in the \_\_\_\_\_
- (VII) The simplest method of analysis of bursting tension in anchorage zone is \_\_\_\_\_
- (VIII) In prestressed concrete beams , prestressing results in secondary moments due to \_\_\_\_\_
- (IX) For computing the deflection of composite beams due to live load, the second moment of area to be used should be on that of \_\_\_\_\_
- (X) The design of PSC electric poles combined bending and torsion develops due to \_\_\_\_\_
- (XI) The minimum section modulus of a prestressed concrete section is influenced by \_\_\_\_\_
- (XII) The concept of equivalent prism for eccentric cables was developed by \_\_\_\_\_

## Group-B (Short Answer Type Question)

*Answer any three of the following*

[ 5 x 3 = 15 ]

2. What type of aggregates are recommended for the production of high strength concrete? [ 5 ]
3. Explain the various modes of failure encountered in prestressed concrete beams subjected to bending moment shear and torsion. [ 5 ]
4. The horizontal prestress at the centroid of a concrete beam of rectangular cross section , 120mm by 250 mm is 7 N/mm<sup>2</sup> and the maximum shearing force on the beam is 70KN. Calculate the maximum principal tensile stress. [ 5 ]
5. Briefly outline the Mangels method computing the horizontal and transverse stress in end blocks subjected to concentrated force from anchorage. [ 5 ]
6. A concrete box section girder has an overall depth and width 800 and 600 mm, respectively. The concrete walls are 100 mm thick on both the horizontal and vertical parts of box. Determine the maximum permissible torque if the section is uniformly prestressed by a force 200 KN. Assume the maximum permissible diagonal tensile stress as 0.7 N/mm<sup>2</sup> [ 5 ]

## Group-C (Long Answer Type Question)

*Answer any three of the following*

[ 15 x 3 = 45 ]

7. (a) A prestressed concrete beam 400 mm X 600 mm in section has a span of 6 m and is subjected to a uniformly distributed load of 16 KN/ m including the self weight of the beam. The prestressing tendons are located at the lower third point and provide an effective prestressing force of 960 KN. Determine the extreme fibre stresses in concrete at the midspan section. [ 8 ]
- (b) A prestressed concrete beam 250 mm wide and 375 mm deep is prestressed by concentrically placed tendon. The span of the beam is 8 m and the beam has to support an imposed load of 4.25 KN/m. Find the prestressing force necessary so that the tension is just avoid at the soffit of the mid section. [ 7 ]  
If however, the tendon is provided at an eccentricity of 65 mm find the prestressing force necessary so that tension is just avoided at the soffit of the mid section

8. A post tensioned concrete beam of rectangular section is 250 mm wide and 450 mm deep. The beam is prestressed by two cables of area 510 mm<sup>2</sup> each, which are initially prestressed to 1500 N/mm<sup>2</sup>. The eccentricity of the cables is 90 mm through the length of the beam, the span of the beam 8 m. Ignoring all losses find the deflection at the centre when the beam supports its own weight. [ 15 ]  
What would be the deflection at the centre when the beam carries an imposed load of 15 kn/m and there is a 20 % loss in prestress. Concrete weighs 24 kn/m<sup>3</sup>. Modulus of elasticity for concrete is 40 kn / mm<sup>2</sup>.
9. The end block of a post tensioned prestressed member is 600 mm wide and 600 mm deep. One cable comprising 8 wires of 12 mm diameter stands carrying a load of 1160 kN are anchored by plate anchorages, 160 mm square located with their centres at 135 mm from the edges is 50 mm in diameter. Values of  $f_{ck} = 45 \text{ N/mm}^2$ ,  $f_{ci} = 25 \text{ N/mm}^2$  and  $f_y = 250 \text{ N/mm}^2$ . Using IS : 1343-1980, design the suitable anchorage for the end block. [ 15 ]
10. A prestressed concrete beam of rectangular beam of rectangular section is 150 mm wide, 375 mm deep and is simply supported over a span of 8 meters. The beam is concentrically prestressed by a cable carrying an effective prestressing force 337.50 KN. The beam supports an all inclusive load of 8 Kn/m. Compare the principal tensile stresses induced in the beam with and without the prestress, at the support section. [ 15 ]
11. A rectangular concrete beam of cross-section 30 cm deep and 20 cm wide is prestressed by means of 15 wires of 5 mm diameter located 6.5 cm from the bottom of the beam and 3 wires of diameter 5 mm, 2.5 cm from the top. Assuming the prestress in the steel as 840 N/mm<sup>2</sup>, calculate the stresses at the extreme fibers of the mid-span section when the beam is supported its own weight over span of 6m. If a uniformly distributed live load of 6kN is imposed, evaluate the maximum working stress in concrete. The density of concrete is 24 KN/m<sup>3</sup>. [ 15 ]

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : CE(PE)701C Hydraulic Structure

Time Allotted : 3 Hours

Full Marks :70

*The Figures in the margin indicate full marks.*

*Candidate are required to give their answers in their own words as far as practicable*

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following : [ 1 x 10 = 10 ]
- (I) Which foundations are suitable for earthen and rock-fill dams?
  - (II) What is the axis of a gravity dam?
  - (III) Which is the simplest type of spillway and may be constructed on small bunds or thin arch dams?
  - (IV) Which dam is suitable for narrow valleys?
  - (V) "The general bed level at the dam site should preferably be lower than that of the river basin." Is the statement correct?
  - (VI) Which line acts as a dividing line between dry (or moist) and submerged line?
  - (VII) "The percentage of energy dissipation in a hydraulic jump increases with the increase in the Froude number." Is the statement true or false?
  - (VIII) Is Tehri dam partly earthen and partly rockfill?
  - (IX) Which foundation is not fit for concrete gravity dam or for rock-fill dams?
  - (X) Which failure occurs when the net horizontal force above any plane in the gravity dam or at the base of the dam exceeds the frictional resistance developed at that level?
  - (XI) The foundation soil for the proposed site of the dam should be examined by which method?
  - (XII) What are transverse joints in concrete gravity dams?

## Group-B (Short Answer Type Question)

*Answer any three of the following*

[ 5 x 3 = 15 ]

2. Classify dams according to their (i) use and (ii) hydraulic designs. [ 5 ]
3. What are the location criteria for dam site? [ 5 ]
4. Explain about Grout curtain and Relief wells. [ 5 ]
5. How the uplift pressure diagram will get modified under
  - i. The presence of a drainage gallery
  - ii. Tension crack near the heel of the dam?[ 5 ]
6. Discuss energy dissipation in hydraulic jump. [ 5 ]

## Group-C (Long Answer Type Question)

*Answer any three of the following*

[ 15 x 3 = 45 ]

7. With the help of neat sketches illustrate: [ 15 ]
  - a) Ogee spillway
  - b) Trough spillway
  - c) Side channel spill way.
8. What are the investigations required for dam site? [ 15 ]
9. (a) Enumerate and explain by neat sketches the different ways by which the earthen dams may fail. [ 9 ]
  - (b) Also suggest suitable precautions that should be under taken to avoid each type of failure. [ 6 ]
10. (a) Differentiate between the following: [ 8 ]
  - i) Diversion dam and gravity dam
  - ii) Rigid dam and non rigid dam
  - (b) Write a short note on foundation problem for dams and their remedies. [ 3 ]
  - (c) Discuss the various factors affecting the choice of type of dam. [ 4 ]
11. What are the factors for selection of site of dam? Explain in detail. [ 15 ]

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : CE(PC)501 Design of RC Structures

Time Allotted : 3 Hours

Full Marks :70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following : [ 1 x 10 = 10 ]
- (I) As per the code IS-456, for controlling the vertical deflection of continuous two-way slabs with Fe415 grade HYSD steel reinforcement bars, the maximum value of the span to overall depth ratio should be .....
  - (II) HYSD bars in either direction in RCC slabs should not be less than ----- of total cross-sectional area.
  - (III) All RCC columns, as per the code IS-456, shall be designed for minimum eccentricity, equal to the unsupported length of column/500 plus lateral dimension/30, subjected to a minimum eccentricity value of ..... mm.
  - (IV) A square-shaped RCC solid slab, supported only on two opposite edges and unsupported on the remaining two edges, may be considered as .....- way slab.
  - (V) For a 2 m long cantilever beam with 1% Fe415 re-bars, the ratio of span to effective depth is .....
  - (VI) The unsupported length between end restraints, as per the code IS-456, should not exceed ..... times the least lateral dimension of a column.
  - (VII) Wind load for RCC structure design may be computed from the code .....
  - (VIII) As per the code IS-456, for deflection control, the basic value of span to effective depth ratio, for continuous spans up to 10 m, should not be greater than .....
  - (IX) For RCC slabs spanning in two directions, the ..... of the two spans should be used for calculating the span to effective depth ratios, as per the code IS-456.
  - (X) Dead load for RCC structure design may be computed from the code .....
  - (XI) Diameter of steel reinforcing bars should not exceed .....mm for a 100 mm thick RCC slab.
  - (XII) Mild steel bars in either direction in RCC slabs should not be less than ----- of total cross-sectional area.

## Group-B (Short Answer Type Question)

Answer any three of the following

[ 5 x 3 = 15 ]

2. Why are the under-reinforced RCC beam sections much better than the over-reinforced RCC sections ? [ 5 ]
3. Determine Fe415 reinforcement for 300 mm x 600 mm M15 beam section with 150 kN.m bending moment. [ 5 ]
4. Explain the concept of stress block for limit state of collapse in flexure. [ 5 ]
5. Calculate Fe250 stirrups for shearing force of 100 kN in 250 x 400 mm M15 beam with 1 % steel re-bars. [ 5 ]
6. Explain, in brief, the structural design procedure of RCC piles and pile cap. [ 5 ]

## Group-C (Long Answer Type Question)

Answer any three of the following

[ 15 x 3 = 45 ]

7. Find out the moment of resistance of a singly reinforced concrete beam of 200 mm width and 400 mm effective depth, if the beam is reinforced with 4 rebars of 16 mm diameter. Consider the grade of steel as Fe415 and grade of concrete as M20. Also, redesign the steel reinforcements in this RCC beam, if required, in compliance with the specifications of the relevant IS code. [ 15 ]
8. Design a balanced singly-reinforced concrete beam section for an applied moment of 60 kN.m in the service condition, if the width of the RCC beam is limited to 175 mm due to some architectural constraints. The design is to be done by using M20 grade of concrete and Fe415 grade of steel reinforcement bars. Also, the design must conform to all the relevant specifications of the code IS:456. [ 15 ]
9. Design a four-span continuous RCC slab for a 6.5 m wide and 13.5 m long hall, by using M20 grade concrete mix and HYSD steel rebars of grade Fe415, if the RCC slab is to be monolithically supported on three intermediate RCC beams of 240 mm sectional width and if the ends of the RCC slab are to be supported on the brick walls of the hall. The roof finishing load is 1.5 kN/m<sup>2</sup> and the service live load on the RCC slab may be taken as 2 kN/m<sup>2</sup> . [ 15 ]

10. Determine the steel reinforcements for a RCC beam if the effective depth of the beam is kept equal to 500 mm due to some architectural constraints. The beam is subjected to a maximum bending moment of 60 kN.m during the service life of the structure and the width of the RCC beam is limited to 175 mm due to space restrictions. The design is to be done by using M20 grade of concrete and Fe415 grade of steel reinforcement bars. Also, find out whether the given beam section is to be doubly-reinforced or not. [ 15 ]
11. A 250 mm wide RCC beam section, having an effective depth of 400 mm, is subjected to ultimate design shear force of 150 kN at the critical section near the supports. The tensile reinforcement at the support location is 0.5 percent. Design the stirrups near the beam supports. Also, design the minimum shear reinforcement at the mid-span, where the shearing force is nearly zero. Assume concrete of grade M20 and mild steel bars of Fe250 grade. [ 15 ]

\*\*\* END OF PAPER \*\*\*



**MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL**

Paper Code : CE(OE)701C Cyber Law &amp; Ethics

Time Allotted : 3 Hours

Full Marks :70

*The Figures in the margin indicate full marks.**Candidate are required to give their answers in their own words as far as practicable***Group-A (Very Short Answer Type Question)**

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) What is Public Domain software ?
- (II) what do you mean by Cyber Law ?
- (III) Which section of IT Act deals with the legal recognition of electronic records ?
- (IV) Which type of Key pair is used in Digital signature ?
- (V) What is cyber crime ?
- (VI) What do you mean by Computer resource ?
- (VII) What is Phishing ?
- (VIII) What are the works of Service Provider ?
- (IX) Linux is which type of software.
- (X) What do you mean by Computer resource ?
- (XI) What is software privacy ?
- (XII) What do you mean by National Agency ?

**Group-B (Short Answer Type Question)***Answer any three of the following*

[ 5 x 3 = 15 ]

2. Explain Ethics for computer user. [ 5 ]
3. Explain Intellectual Property Rights. [ 5 ]
4. Explain Cyber space, Cyber ethics & Cyber Crime . [ 5 ]
5. Explain cyber-Jurisprudence and law in detail. [ 5 ]
6. Explain the four classifications of ethical issues. [ 5 ]

**Group-C (Long Answer Type Question)***Answer any three of the following*

[ 15 x 3 = 45 ]

7. (a) What is the liability of network service providers under the Act? [ 5 ]  
(b) Explain cryptography. List out the types of cryptography algorithm and explain any two of them. [ 5+5 ]
8. (a) Explain the provisions for protection of online trade marks under the Trade marks Act 1999. [ 5 ]  
(b) What is Electronic evidence? [ 5 ]  
(c) What are the legal polices ? [ 5 ]
9. (a) Discuss International Law and Jurisdictional issues in cyberspace. [ 5 ]  
(b) Explain Dispute resolution in cyberspace . [ 5 ]  
(c) What is the role of cyber law? [ 5 ]
10. Write short notes on: a) E-commerce salient features b) Identity theft and fraud c) B2C and C2C [ 5+5+5 ]
11. (a) How plagiarism can be prevented? [ 5 ]  
(b) Explain about E-Governance under Indian Perspective. List out advantage and disadvantage of E-Governance. [ 5+5 ]

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : PEC-IT501B Artificial Intelligence

Time Allotted : 3 Hours

Full Marks :70

*The Figures in the margin indicate full marks.*

*Candidate are required to give their answers in their own words as far as practicable*

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) what are the two characteristics of heuristic knowledge?
- (II) List the quantifiers in first order logic.
- (III) List the two types of Parsing
- (IV) The first and the most simple step in problem-solving is:
  - a. Goal Formulation
  - b. Problem Formulation
  - c. Path Costing
  - d. None of the above
- (V) which search algorithm requires less memory?
- (VI) Knowledge-based agents are composed of two main parts. What are they?
- (VII) How Many Data Type Predicates are there?
  - a. one.
  - b. Two.
  - c. Three.
  - d. Four.
- (VIII) Define Explanation-based learning?
- (IX) A production system consists of \_\_\_\_\_ steps
  - a. one.
  - b. Two.
  - c. Three.
  - d. Four
- (X) Face Recognition system is based on which type of approach?
- (XI) Define Flat Local Maximum ?
- (XII) List the four ways of knowledge representation.

## Group-B (Short Answer Type Question)

*Answer any three of the following*

[ 5 x 3 = 15 ]

2. Explain DFS in AI. [ 5 ]
3. what are the kind of knowledge which needs to be represented in AI systems? [ 5 ]
4. Explain PEAS Representation Model with an example. [ 5 ]
5. What are the differences between the A\* algorithm and the greedy best-first search algorithm? [ 5 ]
6. Explain Utility based agents with suitable diagram. [ 5 ]

## Group-C (Long Answer Type Question)

*Answer any three of the following*

[ 15 x 3 = 45 ]

7. (a) Define Tic-Tac Toe Problem. [ 3 ]  
(b) Explain with an Example [ 12 ]
8. Explain Bidirectional search algorithm with an example [ 15 ]
9. Discuss about features of environment. [ 15 ]
10. (a) State the main features of Hill Climbing Algorithm. [ 3 ]  
(b) Compare Simple hill Climbing algorithm with Steepest-Ascent hill-climbing [ 8 ]  
(c) what is Simulated Annealing? [ 4 ]
11. Give some application areas of AI in Healthcare sector? [ 15 ]

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : HSMC-501 Introduction to Industrial Management (Humanities III)

Time Allotted : 3 Hours

Full Marks :70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) \_\_\_\_\_ is decided on the basis of ordering cost and carrying cost.
- (II) What is GOLF Analysis
- (III) What is Function Cost Matrix?
- (IV) ERP supports \_\_\_\_\_ currency value
- (V) Which type of organization is temporary by nature
- (VI) Which colour is used to illustrate actual progress in bar charts?
- (VII) What is the symbol for activity in a network diagram?
- (VIII) \_\_\_\_\_ shows minimum stock to be maintained.
- (IX) Production Planning and Control function is crucial for ensuring efficiency and cost savings in\_
- (X) State the types of values
- (XI) Who is the head of production department?
- (XII) What is PERT Analysis?

## Group-B (Short Answer Type Question)

Answer any three of the following

[ 5 x 3 = 15 ]

2. List, in order, the six steps basic to both PERT and CPM. [ 5 ]
3. Calculate minimum stock level, maximum stock level, and re-ordering level: [ 5 ]
  - (i) Maximum Consumption = 300 units per day
  - (ii) Minimum Consumption = 180 units per day
  - (iii) Normal Consumption =190 units per day
  - (iv) Reorder period = 10-15 days
  - (v) Reorder quantity = 2,000 units
  - (vi) Normal reorder period = 13 days.
4. Discuss the difference between CPM and PERT. [ 5 ]
5. State the difference between Industrial management and Product Management [ 5 ]
6. What is Job Shop Production? [ 5 ]

## Group-C (Long Answer Type Question)

Answer any three of the following

[ 15 x 3 = 45 ]

7. (a) Write a short note on JIT. [ 5 ]
  - (b) State the advantages of JIT. [ 10 ]
8. (a) State the difference between authority and responsibility [ 8 ]
  - (b) State the process of creating an organization [ 7 ]
9. (a) State the types of formal organization [ 10 ]
  - (b) Write a short note on informal organization [ 5 ]

10. A small project is composed of 7 activities whose time estimates are listed below. Activities are being identified by their beginning (i) and ending (j) node numbers. [ 15 ]

Activities		Time in weeks		
<i>i</i>	<i>j</i>	<i>to</i>	<i>tl</i>	<i>tp</i>
1	2	1	1	7
1	3	1	4	7
1	4	2	2	8
2	5	1	1	1
3	5	2	5	14
4	6	2	5	8
5	6	3	6	15

1. Draw the network
  2. Calculate the expected variances for each
  3. Find the expected project completed time
  4. Calculate the probability that the project will be completed at least 3 weeks than expected
  5. If the project due date is 18 weeks, what is the probability of not meeting the due date?
11. A manufacturing company places a semi-annual order of 24,000 units at a price of Rs. 20 per unit. Its carrying cost is 15% and the order cost is Rs. 12 per order. [ 15 ]
- Calculate:
1. What is the most economical order quantity?
  2. How many orders need to be placed?

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : PCC-CS503 Object Oriented Programming

Time Allotted : 3 Hours

Full Marks :70

*The Figures in the margin indicate full marks.*

*Candidate are required to give their answers in their own words as far as practicable*

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) In which memory a String is stored, when we create a string using new operator?
- (II) \_\_\_\_\_ is an abstract machine. It is a specification that provides runtime environment in which java bytecode can be executed.
- (III) Which of the following keywords are used to control access to a class Member?
  - A) new
  - B) abstract
  - C) public
  - D) interface
- (IV) An abstract class, which declared with the "abstract" keyword, cannot be instantiated. True or False?
- (V) Out of the following which one is not correctly matched ?
  - A) JAVA - Object Oriented Language
  - B) FORTRAN - Object Oriented Language
  - C) C++ - Object Oriented Language
  - D) BASIC - Procedural Language
- (VI) "A package is a collection of classes, interfaces and sub-packages"  
The above statement is true or false?
- (VII) Which of the following statements is valid array declaration?
  - A) int number ()
  - B) float average [ ]
  - C) int marks
  - D) count int[ ]
- (VIII) Java virtual machine is \_\_\_\_\_. Fill in the blank.
  - A) platform dependent totally
  - B) independent
  - C) depends on machine architecture only
  - D) depends on OS only
- (IX) Which method is used to set the graphics current color to the specified color in the graphics class?
- (X) Java is robust because \_\_\_\_\_. Fill in the blank.
  - A) it is object oriented
  - B) garbage collection is present
  - C) inheritance is present
  - D) exception handling
- (XI) Consider the following 2 statements(S1 and S2).  
(S1) C++ uses compiler only.  
(S2) Java uses compiler and interpreter both.  
Above statements are true or false?

(XII) What is the length of the application box made by the following Java program?

```
import java.awt.*;
import java.applet.*;
public class myapplet extends Applet
{
    public void paint(Graphics g)
    {
        g.drawString("A Simple Applet", 20, 20);
    }
}
```

- A) 20
- B) 50
- C) 100
- D) System dependent

**Group-B (Short Answer Type Question)**

Answer any three of the following

[ 5 x 3 = 15 ]

- 2. What is qualified association? Describe with an example [ 5 ]
- 3. What is an object? Why Java is called an object oriented language? Write the difference between procedural oriented programming and object oriented programming. [ 5 ]
- 4. Explain static keyword with suitable Java code. [ 5 ]
- 5. What is dynamic method dispatch in Java? Explain with an example. [ 5 ]
- 6. What AWT? What is Event Listener? [ 5 ]

**Group-C (Long Answer Type Question)**

Answer any three of the following

[ 15 x 3 = 45 ]

- 7. Discuss the differences between the following: [ 5+5+5 ]
  - i) 'throw' and 'throws' clause
  - ii) final and finally
  - iii) Abstract classes and Interfaces
- 8. Write short notes of the following: [ 5+5+5 ]
  - i) Link and Association
  - ii) Thread Life-Cycle
  - iii) Abstraction
- 9. Write short notes of the following: [ 5+5+5 ]
  - i) Dynamic method dispatch
  - ii) Dynamic binding
  - iii) Encapsulation
- 10. Create a package and write a java file with four methods for four basic arithmetic operations such as addition, subtraction, multiplication and division. These methods should save the file in the package. Write one more program that imports the above file to use those four methods. [ 15 ]
- 11. (a) What are exceptions? Explain the user defined exceptions and system defined exceptions with suitable examples. [ 2+6 ]
  - (b) Briefly explain the use of "this" and "super" keywords. [ 4 ]
  - (c) Difference between '==' operator and "equals" methods in the context of string object. [ 3 ]

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : OECCS701B Multimedia Systems

Time Allotted : 3 Hours

Full Marks :70

*The Figures in the margin indicate full marks.*

*Candidate are required to give their answers in their own words as far as practicable*

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following : [ 1 x 10 = 10 ]
- (I) A type of optical media?
  - (II) Tag is used to create a numbered list in HTML?
  - (III) In Audio & Video compression, the term RGB means
  - (IV) State characteristic of a multimedia system?
  - (V) Which image files are lossy format?
  - (VI) DVD stands for
  - (VII) The \_\_\_\_\_ defines the syntax of markup constructs and include additional definitions such as character entity references.
  - (VIII) PDF/A format is
  - (IX) What are multimedia software?
  - (X) A smaller version of an image is called a
  - (XI) \_\_\_\_\_ refers to information types synthesized by the computers.
  - (XII) In Video Compression, an independent frame that is not related to any other frame is called

## Group-B (Short Answer Type Question)

*Answer any three of the following*

[ 5 x 3 = 15 ]

2. Briefly explain JPEG image compression with block diagram. [ 5 ]
3. Define spatial and temporal redundancy? What is QoS? [ 5 ]
4. Write the components of multimedia. [ 5 ]
5. What is Text? What is rich text? What is glyph in Unicode standard? [ 5 ]
6. Write a short note about Video Conferencing. [ 5 ]

## Group-C (Long Answer Type Question)

*Answer any three of the following*

[ 15 x 3 = 45 ]

7. (a) What is the purpose of synchronization? Describe the synchronization accuracy specification factors. [ 7 ]  
 (b) Differentiate between CAV for hard disks and CLV for CDs. Describe Mode 1 and Mode 2 of CD-ROM. [ 5 ]  
 (c) What do you mean by CCD? Why is it used? [ 3 ]
8. (a) What are lossy and lossless compression techniques? Give example of each kind. [ 4 ]  
 (b) Briefly explain JPEG image compression with block diagram. [ 6 ]  
 (c) Write the display sequence and transmission sequence for video frames. Why are they different? [ 5 ]
9. (a) What is sampling? Why is it required in multimedia? Define quantization error with a simple example. [ 5 ]  
 (b) State the Nyquist sampling theorem. A communication channel can carry signal with frequency from 20 Hz to 20 KHz. Determine the sampling frequency. [ 5 ]  
 (c) What are different image file formats? [ 5 ]
10. (a) Why synchronization is necessary in multimedia? Define spatial and temporal redundancy? [ 5 ]  
 (b) What is CAV and CLV in case of spinning disk media? [ 5 ]  
 (c) Describe briefly the display system technique and raster scan method. [ 5 ]
11. (a) What is Multimedia Database? Describe in brief how image database is constructed. [ 5 ]

- (b) What is K-d tree? Explain the structure of 2-dimension K-d tree by using following points: [ 7 ]  
[[6, 1), (5, 5), (9, 6), (3, 6), (4, 9), (4, 0), (7, 9), (2, 9)]
- (c) Define QBIC. [ 3 ]

\*\*\* END OF PAPER \*\*\*





# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : PCC-CS502 Operating Systems

Time Allotted : 3 Hours

Full Marks :70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) The \_\_\_\_\_ must design and program the overlay structure.
- (II) If one or more devices use a common set of wires to communicate with the computer system, the connection is called \_\_\_\_\_
- (III) \_\_\_\_\_ systems have more than one CPU in close communication with the others.
- (IV) FIFO scheduling is \_\_\_\_\_
- (V) A situation where several processes access and manipulate the same data concurrently and the outcome of the execution depends on the particular order in which access takes place is called \_\_\_\_\_
- (VI) A solution to the problem of external fragmentation is \_\_\_\_\_
- (VII) \_\_\_\_\_ will happen if a non-recursive mutex is locked more than once?
- (VIII) Each entry in a translation lookaside buffer (TLB) consists of \_\_\_\_\_
- (IX) On systems where there are multiple operating system, the decision to load a particular one is done by \_\_\_\_\_
- (X) Trap is a \_\_\_\_\_
- (XI) \_\_\_\_\_ are the operations that can be invoked on a condition variable
- (XII) Under multiprogramming, turnaround time for short jobs is usually \_\_\_\_\_ and that for long jobs is slightly \_\_\_\_\_

## Group-B (Short Answer Type Question)

Answer any three of the following

[ 5 x 3 = 15 ]

2. What is a process? With the help of a diagram, explain the different process states. [ 5 ]
3. Explain with example pre-emptive and non pre-emptive scheduling algorithms [ 5 ]
4. What is spooling? Compare SJF and SRTF. [ 5 ]
5. Prove Dekker-Peterson's solution ensures mutual exclusion. [ 5 ]
6. Is segmentation possible without paging? Justify your answer. [ 5 ]

## Group-C (Long Answer Type Question)

Answer any three of the following

[ 15 x 3 = 45 ]

7. Explain multi level feedback scheduling. List the different criteria for scheduling algorithms. [ 5+5+5 ]  
For the processes listed in the table, calculate the average turn around time and average waiting time, for RR (quantum=2) and SRTF.

Process	Arrival Time	Burst Time
P1	0	3
P2	1	6
P3	4	4
P4	6	2

8. List down the methods of deadlock detection and deadlock avoidance. Explain how deadlock can be recovered [ 4+4+4+3 ] through deadlock. What is livelock?
9. Make a comparative analysis of the various scheduling algorithms, How does synchronization and scheduling go hand in hand? [ 8+7 ]
10. Define critical Section. Mention the mechanism to control access to critical section.Explain how use of monitors [ 3+4+8 ] guarantees mutual exclusion.

11. Discuss about shell and kernel. Explain the process of booting. Explain forking. Discuss about orphan, zombie [ 4+2+3+6 ] and daemon process.

\*\*\* END OF PAPER \*\*\*



The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Group-A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for *any ten* of the following: 1×10=10
- (i) If we divide  $-10$  with  $6$  then the remainder will be  
(a)  $-4$  (b)  $4$   
(c)  $2$  (d)  $-2$
- (ii) The truth value of the statement  $x'^2 + 4 = 0$  hold for some real values of  $x'$  is  
(a) true (b) false  
(c) both (a) and (b) (d) None of these
- (iii) For every integer  $x$ ,  $\gcd(x, x + 2) =$   
(a)  $0$  (b)  $2$   
(c)  $1$  (d) None of these
- (iv) In the set  $S = \{1, 2, 3, 4, 6, 9\}$  defines a relation  $R$  by  $aR_b$  if and only if  $b$  is a multiple of  $a$ . Then which one of the following statements is correct?  
(a)  $3$  and  $4$  are comparable (b)  $9$  succeeds  $3$   
(c)  $3$  succeeds  $9$  (d)  $4$  and  $6$  are comparable
- (v) The dual of the statement  $(a \wedge b)$  is  $\vee a = a \wedge (b \vee a)$  is  
(a)  $(a \vee b) \wedge a = a \wedge (b \vee a)$  (b)  $(a \vee b) \wedge a = a \vee (b \wedge a)$   
(c)  $(a \wedge b) \wedge a = a \vee (b \vee a)$  (d)  $(a \wedge b) \vee a = a \vee (b \wedge a)$
- (vi) The total number of positive divisors of  $9216$  is  
(a)  $33$  (b)  $20$   
(c)  $12$  (d)  $14$
- (vii) A non-empty finite poset has  
(a) at most one greatest element (b) at most one least element  
(c) either (a) or (b) (d) both (a) and (b)
- (viii) A poset  $S$  is a lattice if every pair of elements of it has  
(a) greatest lower bound in  $S$ . (b) greatest lower bound and least upper bound in  $S$ .  
(c) greatest and least element in  $S$ . (d) maximal and minimal element in  $S$ .
- (ix) If  $p$ : 'Anil is rich' and  $q$ : 'Kanchan is poor' then the symbolic form of the statement 'Either Anil or Kanchan is rich' is  
(a)  $p \vee q$  (b)  $p \vee \neg q$   
(c)  $\neg p \vee q$  (d)  $\neg(p \wedge q)$
- (x) The sequence represented by the function  $\frac{1}{1-5x}$  is  
(a)  $\{3^n\}$  (b)  $\{5^n\}$   
(c)  $\{5^n + 1\}$  (d)  $\{4^n\}$
- (xi) Solution of the recurrence relation  $a_n = 2a_{n-1} + 1$  with  $a_0 = 0$  is  
(a)  $1 - 2^n$  (b)  $2^n - 2$   
(c)  $2^{n-1} - 1$  (d)  $2^n - 1$
- (xii) The number of ways a null graph having  $4$  vertices can be properly coloured with  $5$  colours is  
(a)  $256$  (b)  $1024$   
(c)  $625$  (d)  $125$

### Group-B

#### (Short Answer Type Questions)

Answer any three questions.

5×3=15

2. Show that  $(\neg q \wedge (p \rightarrow q)) \rightarrow \neg p$  is a tautology.
3. Find the gcd (595, 252) and express it in the form  $252m + 595n$ .
4. Prove that in a distributive lattice if complement of an element exists then it is Unique.
5. Use theory of congruence to prove that for  $n \geq 1, 17|(2^{3n+1} + 3.5^{2n+1})$ .
6. Consider the family of finite sets  $S = \{A_1, A_2, A_3, A_4\}$  where  $A_1 = \{a, b, d, e\}$ ;  $A_2 = \{b, c, d, e, f\}$ ;  $A_3 = \{c, f\}$ ;  $A_4 = \{b, c, f\}$ . Show whether S satisfies the marriage condition. If yes, find two valid SDR of S.

### Group-C

#### (Long Answer Type Questions)

Answer any three of the following.

15×3=45

7. (a) Show that  $((p \vee q) \wedge \sim(\sim p \wedge (\sim q \vee \sim r))) \vee (\sim p \wedge \sim q) \vee (\sim p \wedge \sim r)$  is a tautology.  
(b) Let us consider the discrete mathematics class. If a student  $S_1$  is late, then another student  $S_2$  is late, and if both  $S_1$  and  $S_2$  are late, then the class becomes boring. Suppose that the class is not boring! What conclusion can be drawn about the student  $S_1$  using truth table?  
(c) Show that  $s$  is the valid conclusion from the premises  $p \rightarrow \sim q, q \vee r, \sim s \rightarrow p$ . 5+5+5
8. (a) Find the number of integers between 1 and 1000 both inclusive that are not divisible by any of the integers 2, 3 and 7.  
(b) Find all possible value of  $x$ , for  $345x \equiv 18 \pmod{912}$ .  
(c) Use the Mathematical Induction to prove that:  $A \cap (B_1 \cup B_2 \cup \dots \cup B_n) = (A \cap B_1) \cup (A \cap B_2) \cup \dots \cup (A \cap B_n)$ . 6+5+4
9. (a) Obtain the conjunctive normal form of the following statement:  $(p \rightarrow (q \wedge r)) \wedge (\sim p \rightarrow (\sim q \wedge \sim r))$   
(b) If  $(L, \wedge, \vee)$  be a complemented distributed lattice, then prove that  $(a \vee b)' = a' \wedge b', (a \wedge b)' = a' \vee b'$   
(c) Find the number of integer's  $n, 1 \leq n \leq 1000$  that are not divisible by 5, 6 and 8. 5+5+5
10. (a) A new flag is to be designed with 6 vertical stripes using 4 colours. In how many ways can this be done so that no two adjacent stripes have the same colour?  
(b) Find CNF of  $\neg(p \vee q) \leftrightarrow (p \wedge q)$  using laws of proposition.  
(c) Define CRS (mod  $m$ ). (Complete residue system modulo  $m$ ). Find all CRS (mod 5). 5+5+(1+4)
11. (a) State Pigeonhole Principal and solve:  
A box contains 10 blue balls, 20 red balls, 8 green balls, 15 yellow balls and 25 white balls. How many balls must we choose to ensure that we have 12 balls of the same colour?  
(b) Let  $P$  be a set of  $n$  points lying on the circumference of a circle such that if lines are drawn connecting every point to every other point, then no three of these lines intersect in a single point inside the circle. Let  $A$  be the set of all points of intersection of the lines in the interior of the circle. Note that, the points of  $P$  are not included in  $A$ . Find the cardinality of the set  $A$ . 5+10



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : PCC-CS501 Compiler Design

Time Allotted : 3 Hours

Full Marks :70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) If all the operators are binary, then a string of operands and operators is a postfix expression if and only if \_\_\_\_\_
- (II) Given a grammar  $G=(V, T, P, S)$  and every production in  $P$  is of the form  $A \rightarrow \alpha$  where  $A$  is in  $V$  and  $\alpha$  is in  $(V \cup T)^*$ , then  $G$  is \_\_\_\_\_
- (III) A compiler running on computers with a small memory would normally be \_\_\_\_\_
- (IV) Input to LEX is \_\_\_\_\_
- (V) A basic block is \_\_\_\_\_
- (VI) Given a finite automaton  $M=(Q, \Sigma, \delta, q_0, F)$ . If  $\delta$  maps  $Q \times \Sigma$  to  $2Q$ , then \_\_\_\_\_
- (VII) Given a string  $abc$ , the string  $acc$  is a \_\_\_\_\_
- (VIII) A garbage is \_\_\_\_\_
- (IX) How many descriptors are used for track both the registers (for availability) and addresses (location of values) while generating the code?
- (X) A synthesized attribute is an attribute whose value at a parse tree node is defined in terms of \_\_\_\_\_
- (XI) Elimination of loop invariant computation is a peephole optimization. True/False?
- (XII) \_\_\_\_\_ is a loop optimization

## Group-B (Short Answer Type Question)

Answer any three of the following

[ 5 x 3 = 15 ]

2. Describe input buffering in lexical analyser. [ 5 ]
3. Explain the model of a non recursive predictive parser with a diagram. [ 5 ]
4. Find the output, given grammar  $G_1$  and associated semantic rules and input: aadb [ 5 ]
  - $S \rightarrow AS$  {print(1)}
  - $S \rightarrow AB$  {print(2)}
  - $A \rightarrow a$  {print(3)}
  - $B \rightarrow bC$  {print(4)}
  - $B \rightarrow dB$  {print(5)}
  - $C \rightarrow c$  {print(6)}
5. What is ambiguity? Show that  $G_2:\{S \rightarrow aS|Sa|a\}$  is ambiguous [ 5 ]
6. What is code optimization? Optimize the following C-code: [ 5 ]
 

```
count=0;
result= 0;
while(count++ < 20)
{
increment= 2*count;
result +=increment;
}
```

## Group-C (Long Answer Type Question)

Answer any three of the following

[ 15 x 3 = 45 ]

7. For the following grammar [ 3+5+5+2 ]  
E → E or T | T  
T → T and F | F  
F → not F | (E) | 0 | 1  
a) Eliminate left recursion from the above grammar  
b) Find FIRST(X), Follow(X) for each variable in the grammar  
c) Construct a predictive parser table for the grammar  
d) Is the above grammar LL(1). Justify your answer
8. a) What is a compiler? [ 2+10+3 ]  
b) Explain the different phases of compiler with an example  
c) Compare and contrast between a compiler and an interpreter
9. i) Express the expression  $y = (a+b) * c$  in [ 9+6 ]  
a.) postfix notation  
b.) Abstract syntax tree  
c.) Three address code  
ii) Implement the TAC using  
a. quadruples  
b. triples  
c. indirect triples
10. Consider the regular expression  $(a+b)^* a (a+b) (a+b)$  [ 3+6+3+3 ]  
I. Augment the expression and construct the syntax tree for the above regular expression  
II. Find Firstpos() and Lastpos() for every internal node in the syntax tree  
III. Find Followpos() for every position in the syntax tree  
IV. Construct the corresponding DFA for the given RE using Followpos()
11. a) What is LEX? [ 1+5+9 ]  
b) Explain the working of LEX  
c) Show the step by step construction of a lexical analyzer with the following three tokens  
• a  
• abb  
• a\*b+

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : PEC-CS702E Cyber Security

Time Allotted : 3 Hours

Full Marks :70

*The Figures in the margin indicate full marks.*

*Candidate are required to give their answers in their own words as far as practicable*

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) "Cyberspace" was coined by \_\_\_\_\_.
- (II) Which is the oldest techniques used by hackers for phone hacking to make free calls?
- (III) An attempt to steal, spy, damage or destroy computer systems, networks, or their associated information is known as \_\_\_\_\_.
- (IV) The Code Red is a sort of a \_\_\_\_\_.
- (V) Give an example of physical hacking.
- (VI) What is the existence of weakness in a system or network is known as?
- (VII) Which independent type of malicious program does not require any host program?
- (VIII) What are Trojan-Horse programs?
- (IX) When there is an excessive amount of data flow, which the system cannot handle, \_\_\_\_\_ attack takes place.
- (X) A \_\_\_\_\_ can be a hardware device or a software program that filters all the packets of data that comes through a network, the internet, etc.
- (XI) The Hacker who did break the SIPRNET system is \_\_\_\_\_.
- (XII) A cyber-criminal or penetration tester uses the additional data that stores certain special instructions in the memory for activities to break the system. Name the type of attack.

## Group-B (Short Answer Type Question)

Answer any three of the following

[ 5 x 3 = 15 ]

2. Discuss Security Architecture. [ 5 ]
3. Mention the difference between symmetric and asymmetric encryption. [ 5 ]
4. Write the steps to analyze the E-Mail Application's security vulnerabilities. [ 5 ]
5. What is a response code? List them. [ 5 ]
6. Discuss matrix mining. [ 5 ]

## Group-C (Long Answer Type Question)

Answer any three of the following

[ 15 x 3 = 45 ]

7. With a diagram, explain handshake protocol action. Explain SSL protocol stack. [ 10+5 ]
8. Discuss security policy database. With a neat diagram, explain ip traffic processing. [ 5+10 ]
9. Explain the different Threats to Information System? What do you mean by Information Assurance ? [ 10+5 ]
10. What do you mean by packet filtering in Firewall? Explain Firewall and working of Firewall? Explain the need to take Backup? [ 4+5+6 ]
11. Elaborate: "Cyber crime play a vital role against person ,property and govt. to protect all valuable information and rights". [ 15 ]

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : PEC-CS701B Cloud Computing

Time Allotted : 3 Hours

Full Marks :70

*The Figures in the margin indicate full marks.*

*Candidate are required to give their answers in their own words as far as practicable*

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) Mention the services that are provided by Window Azure.
- (II) Fill in the blanks  
Hotmail is part of Microsoft's \_\_\_\_\_ cloud service.
- (III) What is Microsoft Azure?
- (IV) Give examples of the most commonly used message-passing format language
- (V) What are some of the cloud computing platform databases?
- (VI) Fill in the blanks  
salesforce.com is a \_\_\_\_\_ platform.
- (VII) What is the acronym for FCAPS in cloud management software?
- (VIII) What is Event-driven SOA 2.0?
- (IX) Fill in the blank:  
In SaaS model, everything from the application down to the infrastructure is the \_\_\_\_\_ responsibility.
- (X) What is application porting in cloud computing
- (XI) What is Pods?
- (XII) \_\_\_\_\_ is a characteristic of cloud computing that is used to handle the increasing workload by increasing in proportion amount of resource capacity.

## Group-B (Short Answer Type Question)

*Answer any three of the following*

[ 5 x 3 = 15 ]

2. Give some issues that arise in cloud computing. [ 5 ]
3. Write short notes on CardSpace IDaaS system [ 5 ]
4. 'IDaaS interoperability' how does it work? [ 5 ]
5. What factors need to be analyzed for securing a cloud computing system? [ 5 ]
6. Write short notes on : Open SaaS [ 5 ]

## Group-C (Long Answer Type Question)

*Answer any three of the following*

[ 15 x 3 = 45 ]

7. (a) What are the main features of Google's App Engines? Discuss various web hosting features of this cloud service. [ 5 ]
- (b) What are the main elements of Microsoft's Azure cloud service? [ 5 ]
- (c) Discuss the secure access control mechanisms of Microsoft's AppFabric service. [ 5 ]
8. (a) What are the different categories of services are offered in PaaS? [ 5 ]
- (b) Give an example of any Content Management system (CMS) and Customer Relationship Management system (CRM), and explain their operation on PaaS SOA. [ 10 ]
9. (a) What is the role customer/user in PaaS cloud computing? [ 5 ]
- (b) Give a suitable example of a PaaS platform, and described its functionalities. [ 6 ]
- (c) What are the limitations of software development in a PaaS platform? [ 4 ]
10. (a) Explain the Brokered cloud storage access mechanism with illustrative diagrams. [ 11 ]



- (b) How to deal with storage location and tenancy for securing data? [ 4 ]
11. (a) Explain the Jericho Forum's Cloud Cube Model with a diagram [ 9 ]
- (b) Discuss various cloud deployment models [ 6 ]

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : ESC501 Software Engineering

Time Allotted : 3 Hours

Full Marks :70

*The Figures in the margin indicate full marks.*

*Candidate are required to give their answers in their own words as far as practicable*

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) The CMMI was developed to combine multiple \_\_\_\_\_ into one framework..
  - A) Meta model
  - B) Business maturity models
  - C) Bootstrap
  - D) All of the mentioned above
- (II) What is the use of CMMI?
  - A) Decreases risks in software
  - B) Encouraging a productive
  - C) Streamlines process improvement
  - D) All of the mentioned above
- (III) Which of the following is a building block of UML?
  - A) Things
  - B) Relationships
  - C) Diagrams
  - D) All of the mentioned
- (IV) Amongst which of the following is / are the Verification and validation activities.
  - A) Technical reviews, quality and configuration audits
  - B) Algorithm analysis, development testing, usability testing
  - C) Qualification testing, acceptance testing, and installation testing
  - D) All of the mentioned above
- (V) To achieve good design, modules should have
  - A). Low coupling, low cohesion
  - B). Low coupling, high cohesion
  - C). High coupling, low cohesion
  - D). High coupling, high cohesion
- (VI) The planning task is estimation of the resources required to accomplish the software development effort.
  - A) True
  - B) False
- (VII) Which of the following term is best defined by the statement:"a structural relationship that specifies that objects of one thing are connected to objects of another"?
  - A) Association
  - B) Aggregation
  - C) Realization
  - D) Generalization
- (VIII) A typical configuration management (CM) operational scenario involves a \_\_\_\_\_ who is in charge of a software group.
  - A) Project manager
  - B) System engineer
  - C) System administrator
  - D) All of the mentioned above
- (IX) CASE Tool is
  - A). Computer Aided Software Engineering
  - B). Component Aided Software Engineering
  - C). Constructive Aided Software Engineering
  - D). Computer Analysis Software Engineering

- (X) All critical path activities have slack time of  
 A). 0            B). 1            C). 2            D). None of above
- (XI) The SCM repository is the set of \_\_\_\_\_.  
 A) Project database  
 B) Mechanisms and data structures  
 C) A tracking and control  
 D) None of the mentioned above
- (XII) Software configuration management is a set of \_\_\_\_ activities.  
 A) Change management  
 B) Process  
 C) Tracking and control  
 D) None of the mentioned above

**Group-B (Short Answer Type Question)**

*Answer any three of the following*

[ 5 x 3 = 15 ]

2. Write the short notes on: Rayleigh curve, [ 5 ]
3. Discuss the basic COCOMO model for software cost estimation [ 5 ]
4. Write short notes on: Software project plan [ 5 ]
5. Write the short notes Re-engineering legacy systems. [ 5 ]
6. Write the short notes white box testing [ 5 ]

**Group-C (Long Answer Type Question)**

*Answer any three of the following*

[ 15 x 3 = 45 ]

7. a) Explain the software life cycle model that incorporates risk factor [ 15 ]  
 b) Draw the Context level DFD and Level 1 Data Flow Diagram for the system whose requirements are summarized as follows –  
 A store is in the business of selling paints and hardware items. A number of reputed companies supply items to the store. New suppliers can also register with the store after providing necessary details. The customer can place the order with the shop telephonically or personally. In case items are not available, customers are informed. The detail of every new customer is stored in the company's database for future reference. Regular customers are offered discounts. Additionally details of daily transactions are also maintained. The suppliers from time to time also come up with attractive schemes for the dealers. In case, scheme is attractive for a particular item, the store places order with the company. Details of past schemes are also maintained by the store. The details of each item i.e. item code, quantity available etc. are also maintained.
8. a) How function point analysis methodology is applied in estimation of software size? Explain. Why FPA methodology is better than LOC methodology ? [ 15 ]  
 b) An application has the following:10 low external inputs, 12 high external outputs, 20 low internal logical files, 15 high external interface files, 12 average external inquiries and a value adjustment factor of 1.10 . What is the unadjusted and adjusted function point count ?
9. a) Define coupling and cohesion. What are the different types of coupling possible between various modules of a software system. [ 15 ]  
 b) Discuss why "low coupling and high cohesion" are features of good design  
 c) Compute function point value for a project with the following domain characteristics:  
 No. of I/P = 30  
 No. of O/P = 62  
 No. of user Inquiries = 24  
 No. of files = 8  
 No. of external interfaces = 2  
 Assume that all the complexity adjustment values are average.
10. What is regression testing? [ 15 ]  
 What is alpha testing?  
 What is BETA testing?
11. 'Software doesn't wear out' justify [ 15 ]  
 Write the IEEE definition of software engineering  
 Mention the characteristics of software contrasting it with characteristics of hardware

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : HSMC701 Project Management and Entrepreneurship

Time Allotted : 3 Hours

Full Marks :70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following : [ 1 x 10 = 10 ]
- (I) What is idea management system ?
  - (II) Definition of project management
  - (III) If  $PI < 1$ , the company \_\_\_\_\_ the proposal
  - (IV) Define Work breakdown structure
  - (V) Construction of a house is an example of \_\_\_\_\_ term project
  - (VI) Two types of project costs
  - (VII) Define Late Finish (LF)
  - (VIII) \_\_\_\_\_ is one of the qualities of a prospective entrepreneur
  - (IX) The quantity supplied \_\_\_\_\_ when the price of good rises
  - (X) What do you mean by Harvesting strategy ?
  - (XI) As income increases the demand for normal good will \_\_\_\_\_
  - (XII) PERT is also known as \_\_\_\_\_

## Group-B (Short Answer Type Question)

Answer any three of the following [ 5 x 3 = 15 ]

2. Definition of project with example [ 5 ]
3. What is economic appraisal? [ 5 ]
4. What are the 5 phases of project life cycle . Draw the chart [ 5 ]
5. Discuss the initiation phase of a project [ 5 ]
6. Difference between PERT and CPM [ 5 ]

## Group-C (Long Answer Type Question)

Answer any three of the following [ 15 x 3 = 45 ]

7. (a) Company C is planning to undertake a project requiring initial investment of \$105 million. The project is expected to generate \$25 million per year in net cash flows for 7 years. Calculate the payback period of the project. [ 7 ]
- (b) Company C is planning to undertake another project requiring initial investment of \$50 million and is expected to generate \$10 million net cash flow in Year 1, \$13 million in Year 2, \$16 million in year 3, \$19 million in Year 4 and \$22 million in Year 5. Calculate the payback value of the project. [ 8 ]
8. (a) Write about Steps of innovation management [ 5 ]
- (b) What is idea management system? [ 3 ]
- (c) Discuss divergent and convergent system [ 7 ]
9. (a) What is harvesting strategy? [ 6 ]
- (b) Reasons to employ harvesting strategy? [ 9 ]
10. Factors determining market segment [ 15 ]
11. (a) Discuss pre feasibility studies [ 5 ]
- (b) Discuss feasibility studies [ 5 ]
- (c) What are the contents of a detailed project report. [ 5 ]

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : PC-AUE 402/PC-ME402 Fluid Mechanics & Fluid Machines

UPID : 004422

Time Allotted : 3 Hours

Full Marks : 70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) What is the dimension of torque?
- (II) Define hydraulic efficiency of a hydraulic turbine.
- (III) What is surge tank?
- (IV) What is fluids?
- (V) What is minor energy losses in pipes flow ?
- (VI) What is dimension of power?
- (VII) What do you understand by the term boundary layer?
- (VIII) What is the dimension of surface tension?
- (IX) Explain impulse turbine.
- (X) What are the main parts of centrifugal pump?
- (XI) What is kinetic head?
- (XII) what is critical Depth ( $h_c$ ) for flow in open canals?

## Group-B (Short Answer Type Question)

Answer any three of the following :

[ 5 x 3 = 15 ]

2. Water is flowing through a pipe of diameter 5 cm under a pressure of  $29.43 \text{ N/cm}^2$  (gauge) and with mean velocity of 2.0 m/s. Find the total head or total energy per unit weight of the water at a cross section , which is 5 m above the datum line. [5]
3. State Bernoulli's theorem for steady flow of an incompressible fluid with assumptions. [5]
4. Find the kinematic viscosity of an oil having density  $981 \text{ kg/m}^3$ . The shear stress at a point in the oil is  $0.2452 \text{ N/m}^2$  and velocity gradient at that point is 0.2 per second. [5]
5. An oil of sp. Gr. 0.7 is flowing through a pipe of diameter 300 mm at the rate of 500 litres per second. Find the head loss due to friction and power required to maintain the flow for a length of 1000m. Take,  $f = \text{co-efficient of friction} = 0.0048$ . [5]
6. A Kaplan turbine delivers 10 MW under a head of 25 m. The hub and tip diameters are 1.2 m and 3 m. Hydraulic and overall efficiencies are 0.90 and 0.85. If both velocity triangles are right angled triangles, determine the speed, guide blade outlet angle and blade outlet angle. [5]

## Group-C (Long Answer Type Question)

Answer any three of the following :

[ 15 x 3 = 45 ]

7. (a) A plate having an area of  $0.6 \text{ m}^2$  is sliding down the inclined plate at  $30^\circ$  to the horizontal with a velocity of 0.36 m/s. There is a cushion of fluid 1.8 mm thick between the plane and the plate. Find the viscosity of the fluid if the weight of the plate is 280 N. [ 10 ]  
(b) What do you mean by capillarity? [ 5 ]
8. (a) The discharge  $Q$  through an orifice depends on the pressure  $P$ , the density of fluid  $\rho$  and the diameter of the orifice  $d$ . [ 10 ]  
Determine a general formula for the discharge using Buckingham – Ham  $\pi$ -theorem.  
(b) What do you mean by Dimensional Homogeneity? [ 5 ]
9. (a) The space between two square flat parallel plates is filled with oil. Each side of the plate is 720 mm. The thickness of the oil film is 15 mm. The upper plate, which moves at 3 m/s requires a force of 120 N to maintain the speed. Determine [ 10 ]  
(i) The dynamic viscosity of the oil  
(ii) The kinematic viscosity of oil if the specific gravity of oil is 0.95

- (b) Write the unit of Kinematic viscosity and dynamic viscosity. [ 5 ]
10. (a) Two pipes are connected in parallel between two reservoirs that have difference in levels of 3.5 m. [ 7 ]  
The length, the diameter, and friction factor ( $4f$ ) are 2400 m, 1.2 m, and 0.026 for the first pipe and 2400 m, 1 m, and 0.019 for the second pipe.  
Calculate the total discharge between the two reservoirs
- (b) A tank transmits 100 L/s of water to point C where the pressure is maintained at 1.5 kg/cm<sup>2</sup>. The [ 8 ]  
first part AB of the pipeline is 50 cm diameter and 2.5 km long, and the second part BC is 25 cm diameter and 1.5 km long. 63  
The friction coefficient is 0.005 and minor losses are ignored.  
Assuming level at C is (0.0); find the water level (L) in the tank?
11. (a) A model for a spillway must be built in a laboratory where the maximum capacity of the pump is 9 [ 10 ]  
m<sup>3</sup>. The prototype has 300 m<sup>3</sup> maximum discharge and 5 m head on the crest.  
a. Determine the scale ratio for the model? 75  
b. Calculate the head on the crest of the model?  
c. Find the time in model corresponding to 36 hours in prototype?  
d. Determine the loss of power in prototype corresponding to observed 0.05 HP in model?
- (b) What do you mean by kinematic and dynamic similarity? [ 5 ]

\*\*\* END OF PAPER \*\*\*





# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : PC-AUE 404/PC-ME404 Metrology and Instrumentation

UPID : 004427

Time Allotted : 3 Hours

Full Marks : 70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) Define the effective diameter of thread.
- (II) Name an optical device used for flatness testing.
- (III) Write the use of dial indicator.
- (IV) What is tolerance? Give an example.
- (V) Name two equipments used for measurement of torque.
- (VI) Define Interferometry.
- (VII) What is an inverse transducer?
- (VIII) What is Peltier effect?
- (IX) Why slip gauges are termed as 'End Standard'?
- (X) Name some light sources in use for interferometry
- (XI) Why wringing of slip gauge is necessary to build up the required combination?
- (XII) What is interchangeability?

## Group-B (Short Answer Type Question)

Answer any three of the following :

[ 5 x 3 = 15 ]

2. Discuss about GO and NOT GO gauge with sketch. [5]
3. What is the difference between surface texture and integrity? Two different surfaces may have the same roughness value. Why? [5]
4. Explain the need and standard procedure of calibration. [5]
5. What methods are used for measuring surface roughness? [5]
6. What is Optical Flat and explain the use of it. What are the limitations of Optical Flat? [5]

## Group-C (Long Answer Type Question)

Answer any three of the following :

[ 15 x 3 = 45 ]

7. (a) State the different types of errors and explain parallax error. [ 6 ]  
 (b) Write the differences of the following: [ 9 ]
  - i) Reproducibility and Repeatability
  - ii) Precision and Accuracy
  - iii) Line standards and End standard
8. (a) Discuss in details the concept of optical interference. Make necessary sketches. [ 7 ]  
 (b) Make a neat schematic diagram of a Tool Maker's Microscope and state its working principle and applications. [ 8 ]
9. (a) Distinguish between comparison and direct measurement of surface roughness. [ 6 ]  
 (b) With the help of a neat sketch, explain the constructional and operational features of Taylor Hobson Talysurf. [ 9 ]
10. (a) State and explain Taylor's Principle of gauge design. [ 5 ]  
 (b) Tolerances for a hole and shaft assembly having a nominal size of 50 mm are as follows: [ 10 ]
 

+0.02	-0.05
Hole = 50 +0.00 mm	and shaft = 50 -0.08 mm

 Determine the following:
  - (i) Maximum and minimum clearances,
  - (ii) Tolerances on shaft and hole
  - (iii) Allowance,
  - (iv) MML of hole and shaft,
  - (v) Type of fit

11. (a) Make neat labelled sketches of different types of screw threads. [ 7 ]

(b) Derive an expression for measuring simple effective diameter of external screw threads. [ 8 ]

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : PC-ME601 Manufacturing Technology

UPID : 006653

Time Allotted : 3 Hours

Full Marks : 70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) What is selective assembly in manufacturing?
- (II) What are the advantages and disadvantages of CNC machines over NC machines?
- (III) G Code used to cancel cutter compensation is .....
- (IV) What is the full form of FDM in rapid prototyping process?
- (V) Press tools are generally .....working process.
- (VI) What is surface measurements in metrology?
- (VII) What are the tools and instruments in metrology?
- (VIII) What are the main objectives of environmental design?
- (IX) What is EOB in CNC programming?
- (X) What is G90 in G-code?
- (XI) Why copper is generally used as electrode in EDM process?
- (XII) List different types of errors in Gear.

## Group-B (Short Answer Type Question)

Answer any three of the following :

[ 5 x 3 = 15 ]

2. Describe the principle of "Interference " with sketch. [5]
3. Develop the design factors to be considered for redesign of casting based on parting line consideration with suitable sketch. [5]
4. How does the performance of an HSS tool differ from that of a ceramic tool? [5]
5. Explain how the straightness of lathe bed may be checked by using spirit level. [5]
6. Calculate diameter of best wire for a withworth thread of M24 x 7 mm size. [5]

## Group-C (Long Answer Type Question)

Answer any three of the following :

[ 15 x 3 = 45 ]

7. (a) Differentiate between Precision and accuracy. [ 5 ]  
(b) Explain the wringing of Slip gauges with neat sketch. [ 10 ]
8. (a) What are the principles of Design for Manufacture and Assembly? [ 5 ]  
(b) What are the advantages of Design for Manufacture and Assembly? [ 7 ]  
(c) What is Design for Manufacture and Assembly? [ 3 ]
9. (a) What the reaction are possible in cathode (tool) and anode (workpiece) in ECM process? (Assume electrolyte NaCl). [ 7 ]  
(b) What are the operations performed in ECM ? [ 3 ]  
(c) Explain types of plasma arc system. [ 5 ]
10. (a) Distinguish between Line Standard and end Standard. [ 5 ]  
(b) Describe the procedure of measurement of tooth thickness using constant chord method with neat sketch. [ 10 ]
11. (a) What are the elements of associated to CNC part program [ 5 ]  
(b) What are the advantages of Manual part programming? [ 5 ]  
(c) Explain the Microprogram control unit. [ 5 ]

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : OE-ME801H/OE-ME802H Internet of Things (IoT)

UPID : 008271

Time Allotted : 3 Hours

Full Marks :70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) \_\_\_\_\_ is used to reprogram a Bootloader in IoT devices.
- (II) PaaS stands as \_\_\_\_\_
- (III) The standard length of the MAC address is \_\_\_\_\_
- (IV) What is the main purpose of WoT (Web of Things) in the IoT?
- (V) How many number of elements in the Open IoT Architecture?
- (VI) Mobile cloud computing at its simplest refers to an \_\_\_\_\_
- (VII) What is the Arduino UNO?
- (VIII) \_\_\_\_\_ library is used to access I2C in Arduino IoT devices.
- (IX) Mobile Cloud applications move the \_\_\_\_\_ Power and \_\_\_\_\_ away from mobile phone and into cloud.
- (X) Full form of SBC is?
- (XI) IoT-A stands for \_\_\_\_\_
- (XII) Mobile cloud computing at its simplest refers to an \_\_\_\_\_

## Group-B (Short Answer Type Question)

Answer any three of the following :

[ 5 x 3 = 15 ]

2. Write down the differences between TCP & UDP. [5]
3. Describe the techniques of Authentication. [5]
4. Explain the different types of Storage Server. [5]
5. Write down the differences between Data acquisition and Data integration. [5]
6. What is OSI Model? Explain in details. [5]

## Group-C (Long Answer Type Question)

Answer any three of the following :

[ 15 x 3 = 45 ]

7. (a) Write a short note on Cloud Computing. [ 5 ]  
 (b) Write a short note about M2M. [ 5 ]  
 (c) Describe about the basics of networking. [ 5 ]
8. (a) What is IP? Write down the differences between IPV4 & IPV6. [ 1+4 ]  
 (b) Explain the connection establishment procedure in Transport Layer by using diagram. [ 7 ]  
 (c) Write down the differences between connection-oriented protocol & connection-less protocol. [ 3 ]
9. (a) Write a short note on MQTT. [ 5 ]  
 (b) Write a short note on ZigBee. [ 5 ]  
 (c) Write a short note about CoAP. [ 5 ]
10. (a) Explain authorization of devices in details. [ 7 ]  
 (b) Write an example of Authentication. [ 3 ]  
 (c) Write a short note about Unstructured data storage on cloud. [ 5 ]
11. (a) Write down the differences between IoT & IIoT. [ 5 ]  
 (b) What are the applications of IoT in Healthcare ? [ 5 ]  
 (c) Explain the Home automation in IoT. [ 5 ]



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : HM-HU601 Operations Research

UPID : 006650

Time Allotted : 3 Hours

Full Marks :70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) What is WIP inventory?
- (II) in LPP, dual of the dual is \_\_\_\_\_.
- (III) In a transportation problem, when total supply is equal to total demand it is called a \_\_\_\_\_ transportation problem.
- (IV) How a Maximization assignment problem is transformed into a minimization problem?
- (V) What is the full form of CPM in Project management?
- (VI) What is the distribution of service time in a M/M/1 queuing model?
- (VII) What do you understand by Optimum solution in OR?
- (VIII) If a primal problem has 2 constraint and 3 decision variables, then the number of constraint in the dual problem is \_\_\_\_\_.
- (IX) In any transportation problem, if there are 4 supply location and 3 demand locations are there, how many constraint equations will be there in the mathematical model?
- (X) TSP is an assignment problem with additional restriction. (True/False)
- (XI) Which method is used for solving a LPP contains artificial variables?
- (XII) In a transportation problem, there are 3 supply and 4 demand locations. How many minimum number of allocation to be there in the basic feasible solution for consideration the solution as feasible solution?

## Group-B (Short Answer Type Question)

Answer any three of the following :

[ 5 x 3 = 15 ]

2. A television mechanic finds that the time spent to repair a set follows an exponential distribution with a mean time of around 30 minutes. If he repair the set in order which they came in and the arrival of the sets follows a poisson distribution with an approximate average rate of 10 set in a 8 hours day, what is the repairman expected idle time in a day of 8 hours? What would be the expected no of TV set presence in the shop at any point of time? [5]
3. Write short note on EOQ with respect to Inventory management. [5]
4. Food X contains 6 unit of vitamin A per gram and 7 unit of vitamin B per gram and cost Rs 12 per gram. Food Y contains 8 units of vitamin A per gram and 12 units of vitamin B per gram and cost Rs 20 per gram. The daily minimum requirement of vitamin A and vitamin B are 100 units and 120 unit respectively. The objective is to fulfil the minimum requirement of vitamin with minimum cost expenditure to buy the foods. Formulate the LPP for this problem. [5]
5. A company has three plants (A, B, C), each can supply of 7, 9 and 18 units respectively. There are four demand location (D1, D2, D3, D4) with a demand of 5, 8, 7, 14 units respectively. The table below, indicate the transportation cost from each plant location to each demand location: [5]  
Use least cost method to find out the initial basic feasible solution for this problem.

	D1	D2	D3	D4
A	19	30	50	10
B	70	30	40	60
C	40	8	70	20

6. Rewrite the following LPP in standard form:

[5]

Minimize  $Z = 2X_1 + X_2 + 4X_3$

Subject to

- 2X<sub>1</sub>+4X<sub>2</sub> ≤ 4  
 X<sub>1</sub>+2X<sub>2</sub>+X<sub>3</sub> ≥ 5  
 2X<sub>1</sub>+3X<sub>3</sub> ≤ 2  
 X<sub>1</sub>, X<sub>2</sub> ≥ 0  
 X<sub>3</sub> Unrestricted in sign (can be both positive and negative)

**Group-C (Long Answer Type Question)**

Answer any three of the following : [ 15 x 3 = 45 ]

7. (a) Describe about the various type of model used in OR, classified based on their function, structure and nature of environment. [ 6 ]  
 (b) Name the three phases involves in any scientific method. Also, write down the name of the activities associated in each phases. [ 5 ]  
 (c) What are the shortcomings in Operations Research? [ 4 ]
8. (a) A company manufacturing two products namely product A and product B with high and low quality with a profit of Rs 4 and Rs 3 per piece respectively. Product A required twice manufacturing time that of product B and if only the product B is manufactured, the company can make 1000 pieces of product B in one day. Raw material 1, which is a common raw material for both the product, is required one piece each for both the products. Supply of raw material 1 is limited to 800 pieces per day. Product A is required a special packaging which is available only 400 pieces per day and similarly the packaging for product B is available only 700 pieces per day. Formulate the LPP and solve it by graphical method to determine the optimum product mix. Also determine the maximum profit. [ 9 ]  
 (b) With the help of three neat sketches, explain the following three exceptional cases in LPP. [ 6 ]  
 (a) Alternate maxima, (b) Unbounded Solution and (c) Infeasible solution
9. For the following activities, draw the project network diagram and find out overall project completion time and the total cost of this project. The indirect cost is Rs. 50/day. [ 15 ]  
 If this project need to be crashed by 3 days in total, what are the activities need to be crashed. What will be revised project cost in that case.

Activity	Preceding Activity	Normal		Crash	
		Time (days)	Cost (Rs)	Time (days)	Cost (Rs)
A	none	3	300	2	400
B	A	3	30	3	30
C	A	7	420	5	580
D	A	9	720	7	810
E	B	5	250	4	300
F	C,D,E	6	320	4	410
G	F	4	400	3	470
H	F	13	780	10	900
I	G	10	1000	9	1200

10. (a) A LPP is stated as follows: [ 5 ]  
 Minimize  $Z = 20X + 10Y$   
 Subject to  
 $5X + Y \geq 6$   
 $2X + 2Y \geq 8$   
 $X, Y \geq 0$   
 Write down the dual LPP of the following primal LPP.
- (b) Solve the above primal LPP by applying either two phase or Big- M method [ 10 ]

11. (a) In the perspective of decision making process, explain following; [ 5 ]  
Degree of Knowledge  
Decision alternatives  
States of Nature  
Payoff  
Payoff Matrix
- (b) Write short note on Decision Tree analysis [ 5 ]
- (c) Explain the decision making process adopted under different (four level) degree of Knowledge of any system. [ 5 ]

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : PE-ME601A/PE-ME602A Internal Combustion Engines and Gas Turbines

UPID : 006654

Time Allotted : 3 Hours

Full Marks : 70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) What is brake thermal efficiency?
- (II) Write the composition of natural gas.
- (III) A Gas Turbine is which type of combustion plant?
- (IV) Write two requirements of ideal rocket propellant.
- (V) Name the four different strokes in case of 4S engine.
- (VI) What are the reference fuels for Octane number?
- (VII) State one limitation of Morse test.
- (VIII) Write the composition of biogas.
- (IX) What is the range of pressure ratio for a gas turbine plant?
- (X) What is Ram jet engine?
- (XI) Why is a choke used in a carburettor?
- (XII) Write one factor on which delay period depends.

## Group-B (Short Answer Type Question)

Answer any three of the following :

[ 5 x 3 = 15 ]

2. Write the advantages and disadvantages of using alternative fuels. [5]
3. Write a short note on Morse Test. [5]
4. Discuss the effect of regeneration on the simple gas turbine cycle. [5]
5. How are gas turbines classified? [5]
6. Explain briefly the combustion phenomenon in CI Engine. [5]

## Group-C (Long Answer Type Question)

Answer any three of the following :

[ 15 x 3 = 45 ]

7. In an engine working on dual cycle, the temperature and pressure at the beginning of the cycle are 900C and 1 bar. The compression ratio is 9. The maximum pressure is limited to 68 bar and the total heat supplied per kg of air is 1750 kJ. Determine (a) Pressure and temperature at all salient points (b) Air standard efficiency (c) Mean effective pressure. [ 15 ]
8. One kg of ethane is burned with 90% theoretical air. Assuming complete combustion of hydrogen in the fuel, determine the volumetric analysis of the dry products of combustion. [ 15 ]
9. (a) Explain briefly the combustion phenomenon in SI Engine [ 5 ]  
(b) How tetraethyl lead improves the quality of fuel for SI engine? [ 5 ]  
(c) Explain briefly the phenomenon of diesel knock. [ 5 ]
10. A four-cylinder four-stroke engine, having diameter and length of stroke as 100 mm and 120 mm respectively is running at 1800 rpm. Its carburetor venturi has a 28 mm throat. Assuming the co-efficient of airflow 0.8, the density of air is 1.2 kg/m<sup>3</sup> and the volumetric efficiency of the engine is 75%, determine the suction at the throat. [ 15 ]
11. (a) Explain with a neat sketch the basic working cycle for turbo-jet engines. [ 10 ]  
(b) Write the advantages and disadvantages of turbo-jet engine. [ 5 ]

\*\*\* END OF PAPER \*\*\*





# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : PE-ME801B/PE-ME802B Power Plant Engineering

UPID : 008278

Time Allotted : 3 Hours

Full Marks : 70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following : [ 1 x 10 = 10 ]
- (I) What is used to reduce the sulfur emission in the FBC system?
  - (II) What is Mach number?
  - (III) Define blade friction coefficient.
  - (IV) What is evaporative condenser?
  - (V) Load duration curve indicates \_\_\_\_\_
  - (VI) What do you mean by station cost?
  - (VII) Can coal be transported through pipeline?
  - (VIII) Write down the expression of the area-velocity relation used in the nozzle.
  - (IX) What is symmetrical blading?
  - (X) Name two factors that create loss of vacuum in a condenser.
  - (XI) What is superheating?
  - (XII) What is soot blowers?

## Group-B (Short Answer Type Question)

Answer any three of the following : [ 5 x 3 = 15 ]

2. A power plant using steam as working fluid operates on a Rankine cycle. The boiler and condenser pressures are 30 bar and 1 bar. The conditions of steam entering the turbine is dry saturated. Find the thermal efficiency of the plant. Neglect the pump work. [5]
3. Discuss the merits of forced draught over induced draught. [5]
4. What are the different losses which are generally taken into account in designing the draught system? [5]
5. Write a short note on electrostatic precipitator. [5]
6. Write a short note on cooling pond used in thermal power plants. [5]

## Group-C (Long Answer Type Question)

Answer any three of the following : [ 15 x 3 = 45 ]

7. (a) In a steam power plant, steam is supplied at 100 bar and 500 °C and the condenser pressure is 0.05 bar. The steam is reheated after passing through a first-stage turbine to its original temperature and then expanded to condenser pressure. The reheating is carried out when the steam becomes just dry saturated. Assume the isentropic efficiency of each stage of expansion as 85% Find the efficiency of the plant. [ 10 ]
- (b) Also, find steam required per hour if the capacity of the plant is 100 MW. Neglect the feed pump work. [ 5 ]
8. (a) What do you understand by the word Draught? [ 3 ]
- (b) How are the draughts classified? [ 2 ]
- (c) Find the expression of draught produced by a chimney in mm of water head. [ 10 ]
9. (a) List out the major advantages of high-pressure boilers in modern thermal power plants. [ 5 ]
- (b) What do you understand by a supercharged boiler? [ 5 ]
- (c) What is the difference between fouling and slagging? [ 3 ]
- (d) What are their effects on boiler performance? [ 2 ]
10. (a) What is the necessity of coal storage? [ 5 ]
- (b) Discuss the different methods of coal storage. [ 10 ]
11. (a) Define the function of nozzle and name some applications where it is used. [ 5 ]

(b) Derive an expression relating the critical pressure ratio to the index of expansion  $n$  for expansion in a nozzle. [ 10 ]

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : PC-ME401 Applied Thermodynamics

UPID : 004476

Time Allotted : 3 Hours

Full Marks : 70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following : [ 1 x 10 = 10 ]
- (I) What is degree of reaction ?
  - (II) Give one example of liquid fuel.
  - (III) Name one cycle where phase change of working fluid is taking place.
  - (IV) What is apparatus dew point ?
  - (V) Which pressure is greater, static or stagnation ?
  - (VI) Write down the expression for isentropic efficiency explaining all the terms.
  - (VII) What is nozzle efficiency ?
  - (VIII) What is isothermal process ?
  - (IX) Name the type of seal used in steam turbine to prevent leakage.
  - (X) What is adiabatic flame temperature ?
  - (XI) Reheat pressure is generally how much percentage of boiler pressure ?
  - (XII) What is bulb depression ?

## Group-B (Short Answer Type Question)

Answer any three of the following : [ 5 x 3 = 15 ]

2. Derive Diesel cycle efficiency with appropriate p-v diagram. [5]
3. Describe with neat sketch adiabatic saturation process. [5]
4. Write a short note on complete combustion with example. [5]
5. A diesel engine has a compression ratio of 14 and cut off takes place at 6% of stroke. Find the air standard efficiency. [5]
6. Compare Rankine cycle with Carnot cycle. [5]

## Group-C (Long Answer Type Question)

Answer any three of the following : [ 15 x 3 = 45 ]

7. An ideal diesel engine operates within the temperature limits of 1700 K and 300 K and with a compression ratio of 16. Determine a) pressure and temperature at each cardinal point of the cycle, b) thermal efficiency of the engine, c) work ratio and d) MEP [ 15 ]
8. (a) Show that enthalpy of a moist air stream remains constant during an adiabatic saturation process. [ 5 ]  
(b) Describe adiabatic mixing process. Also, show the process on psychrometric chart. [ 5 ]  
(c) Write short note on by pass factor of a heating and cooling coil. [ 5 ]
9. (a) Distinguish between ultimate and proximate analysis. [ 5 ]  
(b) Write a short note on dew point temperature of combustion products. [ 5 ]  
(c) Write a short note on types of fuel with examples. [ 5 ]
10. A steam power plant operates in a Rankine cycle with superheated steam. The inlet steam conditions are 20 bar, 360 °C. The steam undergoes isentropic expansion in the turbine and exhausted to a condenser operating at 0.08 bar. Determine the efficiency of the cycle for 1 kg/s mass flow rate of steam. Use of steam table is allowed. [ 15 ]
11. A reaction vessel contains a mixture of 1 mol H<sub>2</sub>, 1 mol CO<sub>2</sub> and 1/2 mol O<sub>2</sub>. The mixture is heated isobarically at 1 atm to 2500 K. Determine the equilibrium composition. [ 15 ]

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : PC-ME602 Design of Machine Elements

UPID : 006618

Time Allotted : 3 Hours

Full Marks : 70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) What type of load is transmitted by a cotter joint?
- (II) What is the thread angle of an ISO metric thread ?
- (III) Why are Flexible Coupling popular?
- (IV) Which type of Power screw thread has highest efficiency?
- (V) What is module of gear ?
- (VI) Which system of tolerance is used hole basis or shaft basis ?
- (VII) What are the properties of PTFE , that has made it a very useful Engineering Material ?
- (VIII) Which theory gives most accurate result among the Maximum Shear Stress theory and Distortion Energy Theory?
- (IX) Nearly after how many no of cycles the S-N curve becomes asymptotic
- (X) What is the main disadvantage of welding thin walled components ?
- (XI) For which application the Distortion Energy theory is to used?
- (XII) A rotating shaft is supported at the ends and subjected to a point load at the centre. Maximum bending stress developed is 120 MPa. If the yield, ultimate and corrected endurance strength of the material are 360 MPa, 600 MPa and 240 MPa. What is the Factor of Safety?

## Group-B (Short Answer Type Question)

Answer any three of the following :

[ 5 x 3 = 15 ]

2. The Principal stresses at a point in three perpendicular directions are 200 N / sq mm , 150 N / sq mm and 0  
Material is 50C 4 (  $S_{yt} = 460$  N / sq mm . Find the Factor of Safety using Maximum Shear Stress theory. [5]
3. A rotating bar of steel (  $S_{ut} = 630$  N / sq mm ) is subjected to completely reversed bending stress .  
Corrected endurance limit of the bar is 315 N / sq mm . Calculate the fatigue strength of the bar for a life of 90,000 cycles . [5]
4. Name the various elements used in alloy steel and their effects . [5]
5. In a particular application ,the radial load acting on a ball bearing is 5 kN and the expected life for 90% bearing is 8000 hr . Calculate the dynamic load carrying capacity of the bearing . RPM of the shaft is 1450. [5]
6. Explain briefly the factors that affect the Endurance limit of a component ? [5]

## Group-C (Long Answer Type Question)

Answer any three of the following :

[ 15 x 3 = 45 ]

7. (a) Write a short note on different types of keys with sketches to connect the shaft with rotating element [ 9 ]  
(b) The standard cross section for a flat key which is fitted to a 50 mm diameter shaft is 16 x 10 mm. The key is transmitting 475 N m torque from the shaft to the hub. Key is made of commercial steel (  $S_{yt} = S_{yc} = 230$  N / mm<sup>2</sup> )  
Determine the length of the key, if the factor of safety = 3 . [ 6 ]
8. (a) A bronze spur pinion rotating at 600 rpm drives a Cast iron spur gear at a transmission ratio of 4 : 1. The allowable static stresses for the bronze pinion and the cast iron gear are 84 MPa and 105 MPa respectively. [ 8 ]  
The pinion has 16 standard 20° full depth involute teeth of module 8. The face width of the gear is 90 mm.

Calculate the power that can be transmitted from the standpoint of strength.

(b)  $\sigma_r$ A single plate clutch consists of one pair of contacting surf aces. It is used for an engine that develops a maximum torque of 120 Nm . Assume a factor of safety of 1.5 to account slippage at full engine torque. The permissible intensity of pressure is 350 kPa and coefficient of friction is 0.35. Assuming uniform wear theory, calculate the inner and outer diameter of the friction lining. [ 7 ]

9. Design a turnbuckle to connect tie rods of roof structure. Maximum pull in the tie rods is 50 kN. The material of the coupler is FG 200 (  $S_{ut} = 200 \text{ N/mm}^2$  ) and that of tie rod is 30 C8 (  $S_{yt} = 400 \text{ N/mm}^2$  ) . Factor of safety is 5. [ 15 ]

Data for threads M 36 x 3 thread core dia = 31.093 mm M42 x4.5 thread core dia = 36.479 mm

10. (a) What are the modes of failure ? Explain with examples [ 7 ]

(b) A machine element subjected to following stresses: in the x direction 60 MPa , in the y direction 45 MPa, shear stress from x to y = 30 MPa . The material is 45 C 8 for which yield stress is 353 MPa . Find the FOS using [ 8 ]

1) Maximum Shear Stress theory 2) Distortion energy theory

11. (a) W hat is Standardisation in Machine Design ? Explain its importance . [ 3 ]

(b) Describe the various standards used in Engineering Design. [ 9 ]

(c) What is Code? What is the differenweence between Standards and Codes ? [ 3 ]

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : OE-ME801D/OE-ME802D Industrial Pollution and Control

UPID : 008269

Time Allotted : 3 Hours

Full Marks :70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) A safe level of noise depends on\_\_\_\_\_
- (II) Schistosomiasis, a common water contact disease, is spread by\_\_\_\_\_
- (III) Air pollution effects are usually found on the\_\_\_\_\_
- (IV) Sewage water can be purified for recycling by the action of\_\_\_\_\_
- (V) Ringelmann chart is used for the evaluation of \_\_\_\_\_ pollution
- (VI) Which is a secondary air pollutant?
- (VII) Photochemical smog is connected to\_\_\_\_\_pollution
- (VIII) A sewage treatment process, in which a portion of the decomposer bacteria present in the waste is recycled into the beginning of the process, is called \_\_ treatment.
- (IX) Pneumoconiosis' is a disease caused by the inhalation of \_\_\_\_\_ dust
- (X) Blue baby syndrome in infants is mainly caused by presence of \_\_\_\_\_
- (XI) Name the chemicals which are used in refrigerators and air conditioners and damage ozone layer when released in air.
- (XII) \_\_\_ is used to check water pollution caused by industrial effluents

## Group-B (Short Answer Type Question)

Answer any three of the following :

[ 5 x 3 = 15 ]

2. What is meant by pollution? Name four important causes of pollution. [5]
3. Write a short note on the ozone layer. [5]
4. What is Pollutant? Classified it. [5]
5. Give an account of indoor air pollution. [5]
6. What is meant by the term 'Water Ecology'? [5]

## Group-C (Long Answer Type Question)

Answer any three of the following :

[ 15 x 3 = 45 ]

7. (a) Mention two effect of air pollution on meteorological condition [ 4+7+4 ]  
(b) Write the methods of measurement of meteorological parameters in ambient air  
(c) What is wind rose and lapse rate
8. (a) Give Five properties of water that make it essential for life [ 4+6+5 ]  
(b) List the pollutants present in wastewater of 'electroplating' and 'dairy' industries. Suggest a treatment method for the same  
(c) What are the pollutants present in the industrial effluent of petroleum industry? How can these pollutants be taken care off?
9. (a) What is the meaning of industrial pollution? [ 3+3+9 ]  
(b) What are the major causes of pollution?  
(c) What are the incentives to the industries for pollution control?
10. (a) What is meant by air quality monitoring? Explain any four methods of calculation of air pollution indices for monitoring of air pollutants. [ 7+8 ]  
(b) With the neat sketch explain the working principle of Cyclone separator.
11. (a) Explain in detail about noise mitigation with example [ 8+7 ]  
(b) Elaborate on Kyoto and Montreal protocol

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : PE-ME801E/PE-ME802E Tribology

UPID : 008290

Time Allotted : 3 Hours

Full Marks : 70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) What is the relation between thickness and film thickness?
- (II) How to related viscosity with temperature?
- (III) What is sub-micro non-homogeneity zone?
- (IV) The flash point of lubricant must be \_\_\_\_ working temperature.
- (V) The statement 'high friction ensures high wear' is \_\_\_\_\_
- (VI) What is bearing modulus as applied to the journal bearing?
- (VII) What is thick film bearing is a bearing?
- (VIII) In the case of parabolic pressure distribution, what is the average height of the parabola?
- (IX) For elasto-hydrodynamic lubrication there should be \_\_\_\_\_.
- (X) What is the thickness of external zone in 3 Zone model of simplified model ?
- (XI) As per Archard's wear equation, wear volume in adhesive wear is independent of \_\_\_\_\_.
- (XII) What is bearing characteristic number as applied to the journal bearing?

## Group-B (Short Answer Type Question)

Answer any three of the following :

[ 5 x 3 = 15 ]

2. What are economic aspects of Tribology? [5]
3. What are the various factors affecting wear? [5]
4. Describe different mechanical techniques for manufacturing of surface layer. [5]
5. What are the merits and demerits Gas lubricated bearings? [5]
6. Write down short note on Tilting-Pad Thrust Bearing. [5]

## Group-C (Long Answer Type Question)

Answer any three of the following :

[ 15 x 3 = 45 ]

7. (a) Name different form of surface damage with brief description. [ 4 ]  
 (b) Name different types of Wear Mechanisms. [ 4 ]  
 (c) What are different mechanisms of abrasive wear? [ 3 ]  
 (d) How to calculate abrasive wear is based on the mechanism of micro-cutting? [ 4 ]
8. (a) A journal bearing of width 1 m operates with a shaft of 200 mm diameter which rotates at 1200 rpm. The diametral clearance is 200  $\mu\text{m}$  and absolute viscosity of the lubricating oil at an inlet temperature of 20°C is 40 cP. For an eccentricity ratio of 0.7, calculate the minimum film thickness, attitude angle, maximum film pressure, location of maximum film pressure, load capacity, and coefficient of friction. [ 10 ]  
 (b) Depict the direction of oil flow on the thrust pad bearing. [ 2 ]  
 (c) How to find average pressure on sector shaped pad pads of thrust bearing? [ 3 ]
9. (a) How to strengthening and weakening of the superficial layer? [ 8 ]  
 (b) What is the effect of properties of superficial layer on fatigue strength? [ 7 ]
10. (a) A ball bearing spindle with two radially loaded ball bearings and belt driven at 600 rpm, drives two pumps. The radial load on each bearing is 10 kN. If the basic load capacity of each bearing is 25 kN, calculate the  $L_{10}$  life of the system [ 5 ]  
 (b) Derive pressure distribution, load capacity and time to approach between rectangular plates for Squeeze film lubrication [ 8 ]

(c) Why is external source of pressure required for hydrostatic lubrication? [ 2 ]

11. (a) A hydrostatic thrust bearing with a circular step pad has an outside diameter of 400 mm and recess diameter of 250 mm. (a) Calculate the recess pressure for a thrust load of 100,000 N; (b) calculate the volumetric flow rate of the oil which will be pumped to maintain the film thickness of 150  $\mu\text{m}$  with an oil viscosity of 30 cP; (c) calculate the film stiffness for an applied load of 100,000 N and operating film thickness of 150  $\mu\text{m}$ ; and (d) calculate the pumping loss and the oil temperature rise. The mass density of the oil is 880 kg/m<sup>3</sup> and its specific heat is 1.88 J/g K. [ 8 ]

(b) What is difference between Infinitely Long-Journal Bearing and Infinitely Short Journal Bearing in governing equation also write down polar form in both cases and Compared the load bearing capacity. [ 7 ]

\*\*\* END OF PAPER \*\*\*





# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : ES- ROB401/ES-ME401 Materials Engineering

UPID : 004425

Time Allotted : 3 Hours

Full Marks : 70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) Why carbon is necessary in steel production?
- (II) Why heat treatment is required?
- (III) Give few examples of super alloys.
- (IV) What is the most important alloying element for stainless steel?
- (V) What is the measure of ductility?
- (VI) What do you mean by endurance limit?
- (VII) Define: fatigue property of materials .
- (VIII) What is fluctuating stress?
- (IX) What is about the cooling process of full annealing?
- (X) What is Ferrite?
- (XI) What is 2D defect?
- (XII) What is the relation between true and engineering stress-strain curve?

## Group-B (Short Answer Type Question)

Answer any three of the following :

[ 5 x 3 = 15 ]

2. Explain: Engineering stress-strain curve for mild steel & cast iron. [5]
3. Write the name of the stages in the cup & cone fracture. [5]
4. Describe: Knoop and Vickers microhardness. [5]
5. Explain: Creep testing of materials. [5]
6. Describe the three methods of flame hardening. [5]

## Group-C (Long Answer Type Question)

Answer any three of the following :

[ 15 x 3 = 45 ]

7. What is point defects? Discuss any three types of it. [ 15 ]
8. (a) Describe: Resilience & Proof Resilience. [ 5 ]  
(b) A wrought iron bar 50 mm in diameter and 2.5 m long transmits shock energy of 100N-m. Find maximum instantaneous stress and the the elongation. Take  $E= 200GN/m^2$ . [ 10 ]
9. (a) What is line defects? What are its types? [ 5 ]  
(b) Describe: Edge & Screw dislocations. [ 10 ]
10. (a) Define the FOS for both brittle & ductile material. [ 5 ]  
(b) A shaft is transmitting 100 kW at 160 r.p.m. Find a suitable diameter for the shaft, if the maximum torque transmitted exceeds the mean by 25%. Take allowable shear stress as 70 MPa. [ 10 ]
11. (a) Write short notes on the followings irons. [ 10 ]  
Malleable Cast Iron, Nodular Cast Iron, Grey Cast Iron, White Cast Iron.  
(b) Write about cast iron and explain the factors which affect the structure of cast iron. [ 5 ]

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : PE-ME601B/PE-ME602B Refrigeration and Air Conditioning

UPID : 006655

Time Allotted : 3 Hours

Full Marks : 70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following : [ 1 x 10 = 10 ]
- (I) \_\_\_\_\_ captures contaminated air.
  - (II) What is Absolute humidity?
  - (III) What is the function of cooling tower?
  - (IV) What is the boiling point of Ammonia?
  - (V) The COP of vapor compression refrigeration compared to simple air refrigeration system is \_\_\_\_\_ (high / low)
  - (VI) The Bell-Coleman refrigeration cycle uses \_\_\_\_\_ as refrigerant
  - (VII) In which component, the low pressure and temperature vapor refrigerant enters the vapor compression system?
  - (VIII) Which type of compressor is used in a domestic refrigerator?
  - (IX) What is the condition of refrigerant at the exit of evaporator in aqua-ammonia absorption system?
  - (X) Rotary compressors are operated at \_\_\_\_\_ (high / low) pressure
  - (XI) In a refrigeration cycle, in which component heat absorption takes place?
  - (XII) Two reversible refrigerators are arranged in series and their COP are 4 and 5 respectively. What is the COP of the composite system?

## Group-B (Short Answer Type Question)

Answer any three of the following : [ 5 x 3 = 15 ]

2. What are refrigerants? What is the unit of refrigeration? [ 5 ]
3. Write the main components in a Simple Vapor Compression Refrigeration System ? [ 5 ]
4. What are the desirable properties of refrigerants? [ 5 ]
5. What is the effect in refrigeration cycle with sub cooling and super cooling? [ 5 ]
6. What are the different types of Compressors in refrigeration system? Briefly explain each type. [ 5 ]

## Group-C (Long Answer Type Question)

Answer any three of the following : [ 15 x 3 = 45 ]

7. (a) Discuss the advantages of the dense air refrigeration system over an open air refrigeration system. [ 7 ]
- (b) A heat pump works on a reversed Carnot cycle. The temperature in the condenser coils is  $27^{\circ}\text{C}$  and that in the evaporator coils is  $-23^{\circ}\text{C}$ . For a work input of 1 kW, how much is the heat pumped? [ 8 ]
8. (a) Discuss a comparative list between a vapor-absorption system and vapor-compression system [ 5 ]
- (b) Explain the working principle of a simple three fluid absorption system with the help of a neat schematic diagram. Compare between three fluid and two fluid absorption system. [ 10 ]
9. (a) A reversible engine has ideal thermal efficiency of 30%. When it is used as a refrigerating machine with all other conditions unchanged, what will be the coefficient of performance? [ 7 ]
- (b) In an ideal VCR cycle, the enthalpy of refrigerant in KJ/Kg at the following states is given - inlet of condenser- 283, exit of condenser- 116, exit of evaporator- 232, What is the COP of the cycle? [ 8 ]
10. (a) Derive the coefficient of performance of the Bell-Coleman air refrigeration cycle in terms of the pressure ratio  $r_p$ . [ 9 ]
- (b) A Bell-Coleman air refrigeration cycle works on which cycle? [ 1 ]
- (c) Explain with neat sketch the working principle of Thermoelectric Refrigeration. [ 5 ]
11. (a) Explain Natural & Mechanical Ventilation. [ 8 ]
- (b) Describe Gibbs Dalton law [ 7 ]



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : PC- ROB 402/PC-AUE 401/PC-ME403 Strength of Materials

UPID : 004432

Time Allotted : 3 Hours

Full Marks : 70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) Polar moment of Inertia is summation of \_\_\_\_\_
- (II) What is neutral axis of a beam?
- (III) What are reasons for a beam to deflect?
- (IV) Shear stress at the center of shaft in case of torsion is \_\_\_\_\_
- (V) What is differential formula for finding beam deflection?
- (VI) Hoop stress is how many times the longitudinal stress in case of thin sphere?
- (VII) Write the Moment of Inertia of a circle about its diameter.
- (VIII) Volumetric strain is how many times of hoop strain in case of thin spherical shell?
- (IX) Write the relation between elastic modulus and modulus of rigidity.
- (X) When Shear stress is zero, what is the state of bending moment?
- (XI) Draw The diagram of Mohr's Circle for pure shear.
- (XII) Is always neutral axis passes through centroid of the beam?

## Group-B (Short Answer Type Question)

Answer any three of the following :

[ 5 x 3 = 15 ]

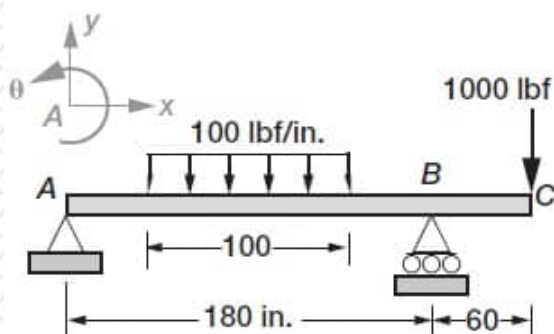
2. Show the stress versus strain curve of a ductile and brittle material. On that curves, show different points. Also show the modulus of toughness on the curve. [5]
3. Derive the Bending Formula of a Beam. [5]
4. Establish the relation between Elastic Modulus(**E**) and Bulk Modulus(**K**) of a material. [5]
5. A beam is 3m long and simply supported. In between 1m to 2m, a uniformly distributed load of **5kN/m** is given. Find the shear force and bending moment Diagrams of the beam after deducing the equations. [5]
6. Define Poisson's ratio. [5]  
Deduce the range of Poisson's ratio of a material.  
Brittle materials do not any specific yield point, so how yield stress are determined for brittle materials?

## Group-C (Long Answer Type Question)

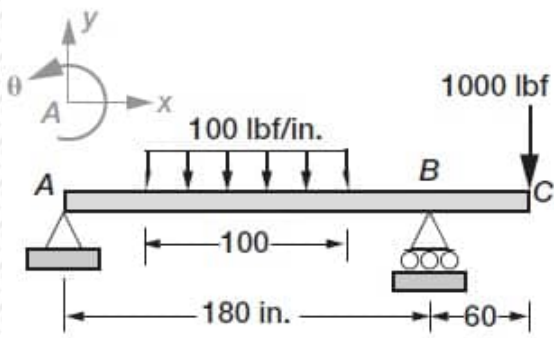
Answer any three of the following :

[ 15 x 3 = 45 ]

7. (a) Find the Shear force diagram of the beam given below [ 6 ]



- (b) Find also the Bending Moment diagram of the beam given below [ 9 ]



8. (a) Find The Euler's Critical load for a column with two end fixed. [ 9 ]  
 (b) A straight bar of alloy, 1m long and 12.5mm by 4.8mm in section, is mounted in a strut-testing machine and loaded axially until it buckles. Assuming the Euler formula to apply, estimate the maximum central deflection before the material attains its yield point of  $208\text{N/mm}^2$ .  $E=70000\text{N/mm}^2$ . [ 6 ]
9. (a) Determine the transverse shear of a I-section. Show the plot of the shear stress. [ 9 ]  
 (b) Determine the transverse shear of a circular cross-section. Show the plot of the shear stress. [ 6 ]
10. (a) Find the value of Maximum deflection of simply supported beam of length with Uniformly distributed load  $W_0$  N/m. EI flexural rigidity of the beam. [ 8 ]  
 (b) What are the limitations of Euler's Column theory? [ 2 ]  
 (c) Derive Rankine-Gordon formula. [ 5 ]
11. A simply supported beam 8m long, is given a distributed force  $4\text{kN/m}$ . A concentrated load of  $10\text{kN}$  is given at point 3m from LHS of the beam, A concentrated moment of  $10\text{kN-m}$  is given at 3m from RHS of the beam. Determine the shear force and bending moment diagram of the beam. Show the equations in the analysis. [ 15 ]

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : BSPH201 Physics-I (Gr-B)

UPID : 002001

Time Allotted : 3 Hours

Full Marks : 70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) What is the zero point energy of a harmonic oscillator?
- (II) What do you mean by the probability of an event?
- (III) What are the types of motion related to a rigid body?
- (IV) What do you mean by polarized light?
- (V) Which magnetic materials have negative susceptibility?
- (VI) At which angle of scattering will the Compton shift be maximum?
- (VII) What is a conservative force?
- (VIII) What are the necessary conditions for a sustainable interference pattern?
- (IX) What do you mean by the 'dielectric constant of glass is 7.0'?
- (X) Does a blackbody always appear as black?
- (XI) What is the effect of damping on the natural frequency of an oscillator?
- (XII) What will be the change in width of the principal maxima, if the wavelength of the light used is increased in Fraunhofer diffraction?

## Group-B (Short Answer Type Question)

Answer any three of the following :

[ 5 x 3 = 15 ]

2. What is the physical significance of the moment of inertia? How is it related to applied torque? [ 5 ]
3. What is diffraction of light, and how does it occur? What is the difference between Fraunhofer diffraction and Fresnel diffraction? [ 5 ]
4. Write the differential equation of motion for a damped oscillation. Solve the differential equation for underdamped motion. [ 5 ]
5. What is the difference between interference of light and diffraction of light? What do you mean by missing order in the diffraction pattern? [ 5 ]
6. Derive the expression of the momentum operator. Check the compatibility between the momentum operator and position operator. [ 5 ]

## Group-C (Long Answer Type Question)

Answer any three of the following :

[ 15 x 3 = 45 ]

7. (a) Establish the differential equation of simple harmonic motion and solve it. [ 4 ]
- (b) A resistance  $R = 100$  ohms, an inductance  $L = 10$  mH, and a capacitor  $C = 100$  micro-Farad are connected in series. Calculate the natural frequency of the circuit. Also, check whether the circuit is oscillatory or not. [ 3 ]
- (c) If  $\phi(x, y, z) = (xyz + 4x^2yz + xyz^2)$ , find  $\vec{\nabla} \phi$  at the point (1, -2, 1). [ 3 ]
- (d) Distinguish between amplitude resonance and velocity resonance of a forced oscillator. [ 3 ]
- (e) Prove that  $\vec{\nabla} \times \vec{r} = 0$ . [ 2 ]
8. (a) Write down the expression of resultant intensity due to single-slit Fraunhofer diffraction. Derive the conditions for maxima and minima. Show that the intensity of the first secondary maxima is around 4.5% of the Principal Maxima. [ 6 ]
- (b) What is double refraction? Distinguish between ordinary ray and extraordinary ray. [ 3 ]
- (c) Can D1 (589.0 nm) and D2 (589.6 nm) lines of sodium light be resolved in first order? Given number of lines in the grating of 2 cm wide are 1500. [ 3 ]

- (d) In Ruby laser, the total number of  $Cr^{3+}$  ions in the excited state are  $3 \times 10^{20}$ . If the laser emits radiation of wavelength 650 nm, calculate the energy of the laser pulse. [ 3 ]
9. (a) Write down the differential equation of a series LCR circuit driven by an AC voltage. Discuss a comparison between mechanical parameters and electrical parameters in relation to oscillation. [ 5 ]
- (b) Give the physical significance of the curl of a vector. Show that  $\vec{F} = (2xy + z^3)\hat{i} + x^2\hat{j} + 3xz^2\hat{k}$  is a conservative force field. [ 4 ]
- (c) Write down the expression of the amplitude of a particle in underdamped motion. Hence, prove that the ratio of successive amplitudes is constant. [ 3 ]
- (d) A pendulum has a period of 1 second and an amplitude of 10 mm. After 10 complete oscillations, its amplitude is reduced to half of its initial amplitude. Calculate the relaxation time of the pendulum. [ 3 ]
10. (a) What is population inversion? Why is it essential for sustainable laser action? Describe the different techniques to create population inversion. [ 6 ]
- (b) Write a short note on the Optical resonator. [ 3 ]
- (c) Two Nicol prism are oriented with their principal planes making an angle of  $60^\circ$ . What percentage of light will pass through the system? [ 3 ]
- (d) How many orders will be visible if the wavelength of incident radiation is 500 nm and the lines on the grating are 2540 to an inch? [ 3 ]
11. (a) Prove that, the rate of loss of energy of a damped vibrator is equal to the rate of work done by the vibrator against the resistive force. [ 4 ]
- (b) Draw the graph of displacement amplitude and velocity amplitude against the frequency of the driven force for different values of the damping coefficient. Also, explain the effect of the damping coefficient on the sharpness of the resonance. [ 5 ]
- (c) An obstacle of height 14.7 m is located at a horizontal distance of 19.6m from a man. At what angle will a man project a particle with an initial velocity of 19.6 m/s so that it can just pass over the obstacle? [ 3 ]
- (d) Show that the vector field  $\vec{A} = (2x + 3y^2)\hat{i} + (y - 3z^2)\hat{j} + (x^2 + y^2 - 3z)\hat{k}$  has neither source nor sink. [ 3 ]

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : BSCH201 Chemistry-I (Gr-A)

UPID : 002002

Time Allotted : 3 Hours

Full Marks : 70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following : [ 1 x 10 = 10 ]
- (I) Which type of isomerism is observed in  $\text{CH}_3\text{CH}_2\text{OH}$  and  $\text{CH}_3\text{OCH}_3$ ?
  - (II) A nucleophile must possess \_\_\_\_\_.
  - (III) Which type of semiconductor is formed when Germanium is doped with Aluminium?
  - (IV) In UV spectroscopy, shift of  $\lambda_{\text{max}}$  towards shorter wavelength is called \_\_\_\_\_.
  - (V) Write the expression of critical pressure.
  - (VI) Give example of a reference electrode.
  - (VII) Write two types of luminescence.
  - (VIII) When do real gases behave as ideal gases?
  - (IX) Write 3 ions which cause alkalinity of water.
  - (X) Arrange NaF, NaCl, NaBr, NaI in order of increasing melting point.
  - (XI) Write the criteria for a compound to be aromatic.
  - (XII) How many NMR signal is obtained for isopropanol [ $\text{CH}_3\text{CH}(\text{OH})\text{CH}_3$ ]

## Group-B (Short Answer Type Question)

Answer any three of the following : [ 5 x 3 = 15 ]

2. Write the differences between p-type semiconductor and n-type semiconductor. [ 5 ]
3. Explain about chromophore and auxochrome with examples. Give the range of UV spectra. [ 5 ]
4. What is MRI? State its uses. [ 5 ]
5. Explain the following two observations - the boiling point of n-pentane is higher than that of neo-pentane,  $\text{H}_2\text{O}$  is liquid while  $\text{H}_2\text{S}$  is gas. [ 5 ]
6. Starting from the expression of free energy  $G = H - TS$ , derive Gibbs – Helmholtz equation for constant pressure. [ 5 ]

## Group-C (Long Answer Type Question)

Answer any three of the following : [ 15 x 3 = 45 ]

7. (a) Show the splitting of d-orbitals in a tetrahedral field. [ 5 ]  
 (b) Low spin complexes are not obtained in tetrahedral crystal field – Give reason. [ 3 ]  
 (c) On the basis of band theory differentiate between conductors, semiconductors and insulators. [ 4 ]  
 (d) What are anti-aromatic compounds? Give examples. [ 3 ]
8. (a) State Lambert-Beers' Law. Show that absorption is linearly proportional to the concentration of the solution. [ 5 ]  
 (b) Which molecules are IR inactive? Give example. [ 3 ]  
 (c) What do you mean by Bathochromic shift and Hypsochromic shift in UV spectroscopy? [ 4 ]  
 (d) Which shift is observed if conjugation is increased? Give reason. [ 3 ]
9. (a) Discuss Fluorescence process with diagram. Explain its uses. [ 6 ]  
 (b) Which electronic transitions are UV active for formaldehyde? Comment on their intensities of absorption. [ 3 ]  
 (c) Which atoms are nmr inactive and why? [ 3 ]  
 (d) What is chemical shift of proton? [ 3 ]
10. (a) Write van der Waal equation mentioning the terms involved. Show the form of van der Waal equation at high pressure and at low pressure. [ 4 ]

- (b) What is Boyle temperature. Show the relation of Boyle temperature with van der Waal's constants. [ 3 ]
- (c) What is compressibility factor? What is its value for ideal gas? [ 3 ]
- (d) Can we liquify a gas by increasing pressure alone? why? [ 3 ]
- (e) What is van der Waal forces? [ 2 ]
11. (a) With the help of a diagram, show the different electronic transitions between the molecular orbitals and comment on their energy differences. [ 5 ]
- (b) How can you differentiate 1,3-pentadiene and 1, 4-pentadiene by UV spectroscopy? [ 5 ]
- (c) A heteronuclear molecule of reduced mass  $1.63 \times 10^{-24}$  gm absorbs at  $2880 \text{ cm}^{-1}$ . Calculate the force constant (k) assuming harmonic oscillator model. [ 5 ]

\*\*\* END OF PAPER \*\*\*





# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : BSM202 Mathematics - IIB

UPID : 002006

Time Allotted : 3 Hours

Full Marks : 70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

(I) Find the value of  $\lim_{z \rightarrow i} \frac{iz+1}{z-i}$

(II) Find the residue of  $f(z) = e^{-\frac{1}{z}}$  at  $z = 0$ .

(III) Find the value of the integral  $\oint_C (x dy - y dx)$  where C is the ellipse  $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ .

(IV) Find the IF of the differential equation  $\frac{dy}{dx} - 3y = \sin 2x$ .

(V) Write the general solution of the ordinary differential equation  $\frac{d^2y}{dx^2} + 4y = 0$ .

(VI) Is the function  $f(z) = |z|^2$  continuous everywhere?

(VII) Find  $\frac{1}{D^2+4}(x)$

(VIII) If  $f(z) = u + iv$  is an analytic function in a finite region and  $u = x^3 - 3xy^2$ , then find  $v$ .

(IX) Find the residue of  $\frac{z^2}{z^2+a^2}$  at  $z = ia$ .

(X) Find the value of  $\int_0^{\frac{\pi}{2}} \int_0^{\sin \theta} r^2 \sin \theta dr d\theta$

(XI) Find the value of  $\iint_S \vec{F} \cdot \hat{n} dS$ , where  $F = 4xz\hat{i} - y^2\hat{j} + yz\hat{k}$ , where S is the surface of cube given by  $x = 0, x = 1; y = 0, y = 1; z = 0, z = 1$ .

(XII) Find the singular solution of  $y = px - \frac{1}{4}p^2$ .

## Group-B (Short Answer Type Question)

Answer any three of the following :

[ 5 x 3 = 15 ]

2.

Prove that  $\lim_{z \rightarrow 0} \frac{\bar{z}}{z}$  does not exist.

[5]

3. Evaluate  $\oint_{|z|=1} \frac{e^{3z}}{(4z-\pi i)^3} dz$ . [5]

4. Solve:  
 $(xy \sin xy + \cos xy)ydx + (xy \sin xy - \cos xy)x dy = 0$  [5]

5. Show that  $J_{-\frac{1}{2}}(x) = \sqrt{\frac{2}{\pi x}} \cos x$  [5]

6. Solve:  $x^2 \frac{d^2y}{dx^2} - x \frac{dy}{dx} + 4y = x \sin(\log x)$  [5]

**Group-C (Long Answer Type Question)**

Answer any three of the following :

[ 15 x 3 = 45 ]

7. (a) Show that  $(3x + 4y + 5)dx + (4x - 3y + 3)dy = 0$  is an exact equation and hence solve it. [5]

(b) Solve:  $\frac{dy}{dx} - \frac{dx}{dy} = \frac{x}{y} - \frac{y}{x}$ . [5]

(c) Solve:  $(x^2y - 2xy^2)dx - (x^3 - 3x^2y)dy = 0$  [5]

8. (a) Prove that  $J'_0 = -J_1$ . [4]

(b) Express  $J_4(x)$  in terms of  $J_0$  and  $J_1$  [5]

(c) Apply the method of variation of parameters to solve  $\frac{d^2y}{dx^2} + a^2y = \sec ax, (a \neq 0)$  [6]

9. (a) Use the transformation  $u = x + y$  and  $uv = y$ , evaluate the double integration  $\int_0^1 dx \int_0^{1-x} e^{\frac{y}{x+y}} dy$ . [5]

(b) Evaluate  $\iiint (x + y + z + 1)^4 dx dy dz$ , over the region bounded  $x \geq 0, y \geq 0, z \geq 0, x + y + z \leq 1$ . [5]

(c) Evaluate  $\iiint z^2 dx dy dz$ , extended over the hemisphere  $z \geq 0, x^2 + y^2 + z^2 \leq a^2$ . [5]

10. (a) Determine the analytic function  $f(z) = u + iv$  whose imaginary part is  $v(x, y) = e^x \sin y$ . [5]

(b) Prove that  $u(x, y) = \frac{1}{2} \log(x^2 + y^2)$  is harmonic and find its conjugate harmonic function  $v(x, y)$  such that  $f(z) = u + iv$  is analytic. [5]

(c) Show that the transformation  $f(z) = \frac{z+i}{z-i}$  maps the interior of the circle  $|w| = 1$  i. e.  $|w| \leq 1$  into the lower half plane  $I(z) \leq 0$ . [5]

11. (a) Prove that  $(x + y + 1)^{-4}$  is an integrating factor of the differential equation

$$(2xy - y^2 - y)dx + (2xy - x^2 - x)dy = 0$$

and hence solve it.

(b) Solve:  $3ydx - 2xdy + x^2y^{-1}(10ydx - 6xdy) = 0$

(c) Solve:  $\frac{dy}{dx} + y = y^3(\cos x - \sin x)$ .

\*\*\* END OF PAPER \*\*\*

[ 5 ]

[ 5 ]

[ 5 ]



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : BSM201 Mathematics - IIA

UPID : 002005

Time Allotted : 3 Hours

Full Marks : 70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) In a scatter diagram, if all the points lie on a rising straight line, then  $(x,y)$  is said to have a \_\_\_\_\_ correlation.
- (II) The rejection probability of Null Hypothesis when it is true is called \_\_\_\_\_.
- (III) Two dice are rolled. If  $X$  and  $Y$  denote the number appeared on first and second die, then  $P(X+Y=6) =$  \_\_\_\_\_.
- (IV) Let  $X$  be a random variable with probability distribution function  $f(x)=0.2$  for  $|x|<1$   
 $= 0.1$  for  $1 < |x| < 4$   
 $= 0$  otherwise  
 The probability  $P(0.5 < x < 5)$  is \_\_\_\_\_.
- (V) If  $X$  and  $Y$  are two normal variates with standard deviations  $s_x$  and  $s_y$  respectively, then the standard deviation of  $X+Y$  is \_\_\_\_\_.
- (VI) Runs scored by batsman in 5 one day matches are 50, 70, 82, 93, and 20. The standard deviation is \_\_\_\_\_.
- (VII) The first moment about zero is the \_\_\_\_\_ of the random variable.
- (VIII) Mean of an exponential distribution with parameter  $\lambda$  is \_\_\_\_\_.
- (IX) If  $X$  and  $Y$  are independent, then their covariance is \_\_\_\_\_.
- (X) Suppose for 40 observations, the variance is 50. If all the observations are increased by 20, the variance of these increased observations will be \_\_\_\_\_.
- (XI) For a continuous random variable  $X$ ,  $P(X=a)$ , where  $a$  is a finite number, is \_\_\_\_\_.
- (XII) If  $\text{Cov}(X,Y) = 0$ , the  $X$  and  $Y$  \_\_\_\_\_ independent.

## Group-B (Short Answer Type Question)

Answer any three of the following :

[ 5 x 3 = 15 ]

2. Fit a straight line  $y = a + bx$  to the following data: [ 5 ]
 

X :	2	5	6	8	9
Y :	8	14	19	20	31

 Predict  $Y$  when  $X = 9.6$ .
3. A random variable  $X$  has the following pdf:  $f(x) = k(x-1)(2-x)$ , for  $1 < x < 2$ . Find [ 5 ]
  - (i)  $k$
  - (ii) The distribution function  $F(x)$ .
4. If  $x = 4y + 5$  and  $y = kx + 4$  be two regression equations of 'x on y' and 'y on x' respectively, then find the interval in which  $k$  lies. [ 5 ]
5. From a large population, a sample of size 400 is drawn with mean 171.38. Can it be reasonably regarded that the mean of the population is 171.17? The s.d. of the population is 3.3. Test 5% level of significance. [ 5 ]
6. The coefficient of rank correlation coefficient of marks obtained by 10 students in English and Economics was found to be 0.5. It was later discovered that the difference in ranks in the two subjects obtained by one of the students was wrongly taken as 3 instead of 7. Find the correct rank correlation coefficient. [ 5 ]

## Group-C (Long Answer Type Question)

Answer any three of the following :

[ 15 x 3 = 45 ]

7. (a) Show that a function which is  $|x|$  in  $(-1,1)$  and zero elsewhere is a possible p.d.f. and find the corresponding distribution function. [ 10 ]
- (b) Find the mean and variance of a continuous random variable having p.d.f. [ 5 ]
 
$$f(x) = 1 - |1 - x|, 0 < x < 2.$$
8. (a) Prove that  $\text{Var}(X + Y) = \text{Var}(X) + \text{Var}(Y) + 2\text{Cov}(X,Y)$ . [ 5 ]

(b) In a joint distribution of X,Y, the marginal distributions of X and Y are as follows:

[ 10 ]

$$\begin{array}{l} X : 5 \quad 7 \\ p_{Xi} : \frac{1}{2} \quad \frac{1}{2} \\ \text{and } Y : 3 \quad 6 \\ p_{Yj} : \frac{1}{3} \quad \frac{2}{3} \end{array}$$

$$\text{If } \text{Cov}(X,Y) = -\frac{1}{2},$$

(i) Construct the joint distribution

(ii) Are X and Y independent ?

(iii) Find  $P(X = 5, Y = 6)$  and  $P(X > Y)$

9. Fit an exponential curve of the form  $y = ab^x$  to the following data:

[ 15 ]

x: 2 3 4 5 6 7  
y: 640 512 410 328 262 210

10. (a) From two cities, two random samples of 600 and 1000 men are drawn respectively. It is found that 400 and 600 men are illiterate among the men in the two samples respectively. Test at 5% level whether the population of the two cities have same percentage of literacy. Given  $z_{0.025} = 1.96$ .

[ 5 ]

(b) A company claims that the consistency regarding life time of electric bulbs produced by them is superior to those of a competitor on the basis of a study which showed that a sample of 30 bulbs made by them has s.d. 25 hours while a sample of 40 bulbs of the competitor has s.d. 27 hours. Test at 5% level whether the claim of the company is justified. Given  $z_{0.05} = 1.645$ .

[ 5 ]

(c) There are two normal populations, I and II, having s.d. 8 and 6 respectively. Two independent samples of size 10 and 12 are drawn from the two populations respectively with sample mean 20 and 27. Test at 1% level whether the two population means are equal. Given  $z_{0.005} = 2.58$ .

[ 5 ]

11. (a) The length of bolts produced by a machine is normally distributed with mean 4 and s.d. 0.5. A bolt is defective if its length does not lie in the interval (3.8, 4.3). Find the percentage of defective bolts produced by the machine. Given,

[ 6 ]

$$\left[ \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{0.6} e^{-\left(\frac{t^2}{2}\right)} dt = 0.7257, \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{0.4} e^{-\left(\frac{t^2}{2}\right)} dt = 0.6554 \right]$$

(b) If the weekly wages of 10,000 workers in a factory follows normal distribution with mean and standard deviation Rs. 70 and Rs. 5 respectively then find the expected number of workers whose weekly wages are

[ 9 ]

(i) between Rs. 66 and Rs. 72. (ii) less than Rs. 66. (iii) more than Rs. 72.

Given that the area under the standard normal curve between  $z = 0$  and  $z = 0.4$  is 0.1554 and  $z = 0$  and  $z = 0.8$  is 0.2881.

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : HMHU201 English

UPID : 002011

Time Allotted : 3 Hours

Full Marks : 70

*The Figures in the margin indicate full marks.*

*Candidate are required to give their answers in their own words as far as practicable*

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) He nearly drove the car for six hours a day. ( Correct the sentence).
- (II) Give four examples of Expository writing.
- (III) What is a business letter ?
- (IV) Write the antonyms of the following adjectives.
  1. ancient
  2. doubtful
- (V) I saw nothing in the bag but husks and dust. ( Make the sentence affirmative).
- (VI) The audience of a football match are pleased when a goal is made. ( Correct the sentence)
- (VII) Make into sentence the following idiom: .
  - i) road block
- (VIII) Nobody had seen her smile. ( Change the voice).
- (IX) I enjoyed the beauty of the nature. ( Correct the answer)
- (X) What are the elements of sensible writing ?
- (XI) The neighbours looked with vast admiration at the things which Issac manufactured. ( Change the voice).
- (XII) He spoke a lie. ( Correct the sentence)

## Group-B (Short Answer Type Question)

Answer any three of the following :

[ 5 x 3 = 15 ]

2. Make into sentence two homonyms :
  - i) Cereal, Serial. [5]
  - ii) Bear, Bare
3. Give an example according to this structure. [5]  
Subject + Verb + subject complement .
4. What is an extended definition? [5]
5. Correct the following sentences : [5]
  - i) They met some day to discuss it.
  - ii) There will be a break of fifteen minutes between each session.
6. What do you understand by Descriptive writing ? Give example. [5]

## Group-C (Long Answer Type Question)

Answer any three of the following :

[ 15 x 3 = 45 ]

7. (a) a. The followers of the king had often praised him to his face. They hated him for his cruelties and vices. They deserted him in the hour of need. ( Combine the above set of sentences into one simple sentence). [ 2 ]
- (b) b. Aristotle was a great philosopher. He wrote many learned books. He devised a new system of logic. He had nevertheless been accused of doing many things unworthy of his high position. ( Combine into a simple sentence). [ 2 ]
- (c) c. People who live in a glass houses should not throw stones at one another. ( Turn into a simple sentence). [ 2 ]
- (d) d. Uneasy lies the crowned head. ( Turn into a complex sentence ). [ 2 ]
- (e) e. Speak the truth . ( Turn into a complex sentence). [ 2 ]
- (f) f. Besides caning the boy he also fined him. ( Turn into compound sentence). [ 2 ]
- (g) g. If you do not work you will fail. ( Turn into compound sentence). [ 2 ]

- (h) h. I am sure you are wrong. ( Turn into compound sentence). [ 1 ]
8. i) Subject + Infinitive verb ( Construct a sentence) [ 15 ]
- ii) It is high time government do something in this matter. ( Correct the sentence).
- ii) It is raining for a week. ( Correct the sentence).
- iii) The earth is moving round the sun. ( Correct the sentence).
- iv) I have arrived yesterday. ( Correct the sentence).
- v) I have seen my friend long ago. ( Correct the sentence).
- vi) You are not understanding my difficulties. ( Correct the sentence).
- vii) Try hard so that you might win. ( Correct the sentence).
- viii) He absented from the meeting. ( Correct the sentence).
- IX) He prides on his success . ( Correct the sentence).
- x) No boy in the class is so good as Amal. (Correct the sentence)
- xi) I feel myself unwell. ( Correct the sentence)
- xii) This is more preferable than that. ( Correct the sentence).
- xiii) Which do you prefer most ? (Correct the sentence).
- xiv) The economical position of the country is bad. ( Correct the sentence).
- xv) It is a clouded day. ( Correct the sentence).
9. (a) a. Rewrite the sentences as directed: [ 2 ]  
The Romans expected to conquer Carthage. ( Change the sentence into a passive form).
- (b) b. I shall be obliged to go. ( Change the sentence into the active form ). [ 2 ]
- (c) c. dr. livingstone I presume ( Put the punctuation mark ). [ 2 ]  
yes said he with a kind smile lifting his cap slightly.
- (d) d. oh sir said ram I am sorry if i have disturbed you ( Put the punctuation ) [ 2 ]
- (e) e. Change the sentence to Indirect : [ 2 ]  
“ I cannot understand why the Spring is so late in coming”, said the Selfish Giant.
- (f) f. Change the sentence to direct speech: [ 2 ]  
Socrates said that he was a citizen, not of Athens, but of the world.
- (g) g. Change the sentence into indirect speech: [ 2 ]  
“ Swallow, Swallow, little Swallow,” said the Prince, “ will you not stay with me one night and be my messenger? The boy is so thirsty, and the mother is so sad.”
- (h) h. Change the sentence to indirect speech. [ 1 ]  
Alexander said to Porus , “ How do you desire to be treated ?” “ Like a king”. “ And you have nothing else to request ?” replied Alexander . “ No”.
10. (a) (A) Put the article (a, an, the ) in the proper place. [ 5 ]
1. I have great deal of work to do . (Correct the sentence).
2. The Magistrate failed to keep peace. ( Correct the sentence ).
3. I took short sleep. ( Correct the sentence).
4. This is slip of tongue. (Correct the sentence ).
5. He made a fun of it. ( Correct the sentence).
- (b) (B) Put preposition if needed. [ 5 ]
1. He is absent at the meeting. ( Correct the sentence).
2. He is confined in bed. ( Correct the sentence).
3. Cats live by milk. ( Correct the sentence).
4. He is good in mathematics. ( Correct the sentence).
5. There is no end of troubles. ( Correct the sentence).
- (c) (C) What is the difference between misplaced and dangling modifiers ? [ 5 ]
11. (a) (i) What do you understand about compounding ? What is compounding in word formation ? Give examples ? [ 4 ]
- (b) (ii) What is Backformation in word formation process ? Give examples. [ 4 ]
- (c) (iii) What is the difference between backformation and clipping ? [ 3 ]
- (d) (iv) What is Blending ? What is an example of Blending word parts ? [ 4 ]

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : EC401 Analog Communication

UPID : 004451

Time Allotted : 3 Hours

Full Marks : 70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following : [ 1 x 10 = 10 ]

- (I) An Amplifier generating no noise should have a Noise Figure of \_\_\_\_\_
- (II) Which component is not common between a tuned radio frequency (TRF) receiver and Super-heterodyne receiver?
- (III) The FCC assigned frequency range for AM broadcasting is \_\_\_\_\_
- (IV) FM signal is a narrow band FM (NBFM), if modulation index is \_\_\_\_\_
- (V) When Gaussian noise passed through the IF amplifier, then the PDF of the output envelope is given by \_\_\_\_\_
- (VI) What is quadrature null effect in synchronous detection technique?
- (VII) What is PSD of White Noise?
- (VIII) What is the low-level carrier called that is sometimes transmitted along with the two sidebands in DSB?
- (IX) A Super heterodyne receiver with I.F of 450 kHz is tuned to a signal at 1200 kHz. Calculate the Image Frequency.
- (X) In order to get good S/N ratio at the destination, the practical FM broadcasting stations use modulation indices (i.e.,  $\beta$  values) of the order of \_\_\_\_\_
- (XI) The image channel rejection in a super heterodyne receiver comes from \_\_\_\_\_ stage only.
- (XII) In a modulation system, on doubling the modulation frequency, the modulation index gets halved while the modulating voltage needed remains unaltered. The modulation system is \_\_\_\_\_

## Group-B (Short Answer Type Question)

Answer any three of the following : [ 5 x 3 = 15 ]

2. What are the advantages of modulation in communication systems? Explain three main reasons with proper example. [5]
3. How AM signal can be detected with Synchronous Detector. [5]  
Sketch the time and frequency domain representation of baseband, carrier, DSB-SC, DSB+C signal.
4. A diode detector has a load of 1 k $\Omega$  shunted by a 10000 pF capacitor. The diode has a forward resistance of 1  $\Omega$ . Find the maximum permissible depth of modulation, so as to avoid diagonal clipping, with modulating signal frequency 10 kHz. [5]
5. Explain the demodulation of FM signal using a Dual-Slope Detector Circuit. [5]  
(use necessary circuit diagram & graphical representation of circuit response with frequency)
6. 24 voice signals are sampled uniformly and then time division multiplexed (TDM). The sampling operation uses flat top samples with 1 $\mu$ s duration. The multiplexing operation includes provision for synchronization by adding an extra pulse of appropriate amplitude and 1 $\mu$ s duration. The highest frequency component of each voice signal is 3.4 kHz. Assuming sampling rate of 8 kHz, Calculate the spacing between successive samples of multiplexed signals. [5]

## Group-C (Long Answer Type Question)

Answer any three of the following : [ 15 x 3 = 45 ]

7. (a) Prove that Fourier transform of  $f(t)\cos(\omega_0 t)$  is  $\frac{1}{2}[F(\omega - \omega_0) + F(\omega + \omega_0)]$ , where  $F(\omega)$  is the Fourier transform of  $f(t)$  [ 5 ]
- (b) Show that:  $\mu = (E_{\max} - E_{\min}) / (E_{\max} + E_{\min})$ , for single tone AM signal. Where,  $E_{\max}$  &  $E_{\min}$  are the max and min amplitude of the AM wave envelope. [ 5 ]
- (c) A 2 MHz carrier is amplitude modulated by a 500 Hz modulating signal to a depth of 70%. If the unmodulated carrier power is 2 kW, then calculate the power of the modulated signal. [ 5 ]
8. (a) [ 5 ]



What is VSB? Draw the block diagram of VSB modulator and demodulator. What are the advantages of VSB over DSB and SSB?

(b) What is the function of AGC in Superheterodyne receiver? What is Delayed AGC? Why it is required? [ 5 ]

(c) A super heterodyne receiver is designed to receive transmitted signals between 5 and 10 MHz. High-side tuning is to be used. Find the tuning range of the local oscillator (LO) for IF frequency 500 kHz. [ 5 ]

9. (a) Draw the phasor diagram of a typical AM, DSB-SC and SSB-SC signals with explanation. [ 5 ]

(b) Draw the Spectral representation of DSB-SC, DSB-FC, SSB-SC, SSB-FC and VSB-SC signals. [ 5 ]

(c) A certain transmitter (AM) is radiating 132kW when a certain audio sine wave is modulating it to a depth of 80% and 150kW when a second sinusoidal audio wave also modulates it simultaneously. What is the depth of modulation for the second audio wave? What is the overall % of modulation? [ 5 ]

10. (a) Show that the envelope detector output will follow the envelope if it satisfies  $RC \leq \sqrt{1-\mu^2} / (\mu\omega_m)$ , where the symbols carry their usual meaning. [ 5 ]

(b) A diode detector load consists of 0.01 $\mu$ F capacitor in parallel with a 5Kohms resistor. Calculate the maximum depth of modulation without diagonal clipping at modulating frequency of 1000 Hz and 10 KHz. [ 5 ]

(c) Compare the merits and demerits of Filter method of SSB-SC generation. How do you overcome the limitations of the above mentioned method? [ 5 ]

11. (a) Describe the effect of variation of modulation index,  $\beta$  on the spectrum of FM signal. [ 5 ]

(b) Derive Carson's Rule regarding FM signal bandwidth. [ 5 ]

(c) A modulating signal  $5 \cos 2\pi 15 \times 10^3 t$ , angle modulates a carrier  $A \cos \omega_c t$ . [ 5 ]

(i) Find modulation index ( $\beta$ ) and bandwidth for both FM and PM signal.

(ii) Determine the change in the bandwidth and the modulation index for both FM and PM, if  $f_m$  is reduced to 5 kHz.

Assume:  $K_p = K_f = 15$  kHz/V.

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : PE-EC802A Mixed Signal Design

UPID : 008347

Time Allotted : 3 Hours

Full Marks : 70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following : [ 1 x 10 = 10 ]
- (I) Find the charge (q) lost by the capacitor during the discharge time for shunt capacitor filter.
  - (II) In a shunt capacitor filter, the mechanism that helps the removal of ripples is \_\_\_\_\_
  - (III) In a discrete time signal  $x(n)=x(-n)$  then it is called ----- signal.
  - (IV) Which type of circuit is generally involves for transmission?
  - (V) Full duplex is the type of transmission mode.(True/False)
  - (VI) A system is said to be----- if the output does not depends on the future input and outputs.
  - (VII) The resolution of a 12-bit DAC using a binary ladder with 10v as the full-scale output will be
  - (VIII) A talkie-talkie operates in-----.
  - (IX) What is the function of low pass filter in phase-locked loop?
  - (X) If  $F_s$  is sampling frequency then the relation between analog frequency  $F$  and digital frequency  $f$  is,
  - (XI) The sampling frequency of the analog signal,  $x(n)=4\sin\pi t + 2\cos 50\pi t$  should be.
  - (XII) A full wave rectifier uses a capacitor filter with  $500\mu\text{F}$  capacitor and provides a load current of 200mA at 8% ripple. Calculate the dc voltage.

## Group-B (Short Answer Type Question)

Answer any three of the following : [ 5 x 3 = 15 ]

2. What are the different types of switch capacitor filter? [5]
3. Find the output voltage of a 4-bit ladder, having the following digital inputs  $V_m=10\text{v}$  [5]  
a) 1001 b) Full-scale input
4. State and prove the sampling theorem [5]
5. A  $100\mu\text{F}$  capacitor when used as a filter has 15V ac across it with a load resistor of  $2.5\text{K}\Omega$ . If the filter is the full wave and supply frequency is 50Hz, what is the percentage of ripple frequency in the output? [5]
6. Draw the block diagram of Pipeline ADC. [5]

## Group-C (Long Answer Type Question)

Answer any three of the following : [ 15 x 3 = 45 ]

7. (a) Draw the circuit diagram and explain the working of a Switched Capacitor(SC) integrator [ 10 ]  
(b) What is switched capacitor (SC)? [ 5 ]
8. (a) Draw the block diagram and explain Dual PLL used to mix down from GSM RF to baseband. [ 12 ]  
(b) What is the loop filter? draw the third order loop filter circuit [ 3 ]
9. (a) Draw circuit diagram of switched-capacitor Compactors and its operation. [ 5 ]  
(b) Draw circuit diagram of switched-capacitor integrator and its operation. [ 5 ]  
(c) Draw circuit diagram of switched-capacitor differentiator and its operation. [ 5 ]
10. (a) What are the specifications of a DAC? Explain any four in detail. [ 8 ]  
(b) Draw the circuit diagram of a pipeline ADC and explain its operation [ 7 ]
11. (a) A 5-bit DAC has a current output. For a digital input of 101000, an output current of 10mA is produced. What will  $I_{\text{OUT}}$  be for a digital input of 11101? [ 5 ]  
(b) What is the largest value of output voltage from an 8-bit DAC that produces 1.0V for a digital input of 00110010? [ 5 ]  
(c) A 5-bit D/A converter produces  $V_{\text{OUT}} = 0.2\text{ V}$  for a digital input of 0001. Find the value of  $V_{\text{out}}$  for an input of 11111. [ 5 ]



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : EC402 Analog Electronic Circuits

UPID : 004452

Time Allotted : 3 Hours

Full Marks : 70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

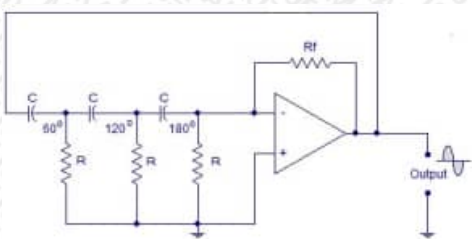
- (I) The CC configuration of BJT is mainly used for \_\_\_\_\_
- (II) The maximum efficiency of a transformer coupled class A power amplifier is.....
- (III) How many stable states are there in a Monostable multivibrator?
- (IV) The value of the output impedance of an ideal op-amp is -----
- (V) The ac input to a half wave rectifier is 28.3Vpeak. Neglecting the drop across the diode, the dc across the load will be -----.
- (VI) The power amplifier that suffers mainly from the problem of crossover distortion is called -----
- (VII) State Barkhausen criteria for oscillation.
- (VIII) In a logarithmic amplifier, the logarithmic effect of the input is obtained from -----
- (IX) Half wave rectifier is an example of a diode clamper circuit. State True/False
- (X) If three cascaded stages of amplifiers have gains of 10,20,30, then what will be overall gain?
- (XI) The voltage gain without negative feedback is 40dB. What is the new voltage gain if 3% negative feedback is introduced?
- (XII) Astable multivibrator operating at 150 Hz has a discharge time of 2.5ms. Find the duty cycle of the circuit.

## Group-B (Short Answer Type Question)

Answer any three of the following :

[ 5 x 3 = 15 ]

2. What are the possible classifications of power amplifiers depending on the positions of their operating point? [5]
3. Derive the expression of Time period of an Astable multivibrator. [5]
4. What is cross-over distortion? How it can be eliminated? [5]
5. Find the oscillation frequency  $f$  of the phase shift oscillator when  $R = 10K\Omega$  and  $C = 6.5nF$  [5]



6. a) Draw the circuit diagram of the Colpitt oscillator. [5]
- b) In a Colpitt oscillator the values of the capacitors are  $C_1 = 0.125\mu F$ ,  $C_2 = 0.02\mu F$ . Inductance coil  $L_1 = 0.5mH$ . Find i) the frequency of oscillation ii) if the frequency of oscillation is 20KHz find the value of inductance of coil iii) determine the voltage gain of the oscillator.

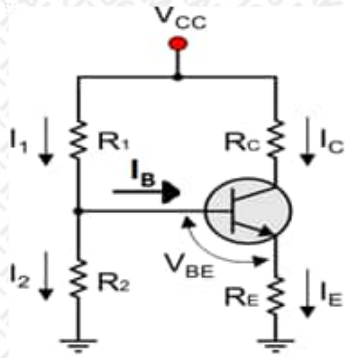
## Group-C (Long Answer Type Question)

Answer any three of the following :

[ 15 x 3 = 45 ]

7. (a) What is rectification? A CT full wave rectifier has turns ratio of 20:1, input supply voltage of 220V and load resistance of  $500\Omega$ . Determine i) the dc output voltage ii) the rms value of load current iii) efficiency of rectifier. [ 1+4 ]
- (b) Design a clamper circuit to create a dc offset of -3V to a sine wave input of amplitude 5V also draw the output waveform. [ 5 ]

- (c) Explain the operation of the LC filter. Determine the ripple factor of a LC-type filter comprising a 10H choke and 8F capacitor used with a full wave rectifier [ 3+2 ]
8. (a) Construct the circuit diagram and the frequency response characteristics of the 2-stage RC coupled CE transistor amplifier and derive its midfrequency voltage gain. [ 8 ]
- (b) Explain the operation of a transformer-coupled Class A power amplifier. [ 7 ]
9. (a) Draw the circuit diagram of a voltage divider bias of a BJT and determine its operating point. [ 2+3 ]
- (b) What is the stability factor? Find out the expression of current stability factor for voltage divider bias configuration. [ 2+3 ]
- (c) If the various parameters of a CE amplifier in voltage divider bias method are  $V_{CC}=12V$ ,  $R_1=10K\Omega$ ,  $R_2=5K\Omega$ ,  $R_C=1K\Omega$ ,  $R_E=2K\Omega$  and  $\beta=100$ , find the operating point and stability factor assuming the transistor is made up of Si. [ 5 ]



10. (a) Define the conversion efficiency of a power amplifier. Prove that the maximum conversion efficiency of a direct coupled class A power amplifier is 25%. [ 4+5 ]
- (b) Prove that the Class B push-pull power amplifier has higher efficiency than Class A amplifiers. [ 6 ]
11. (a) Explain the operation of an integrator circuit using an op-amp. [ 3 ]
- (b) Explain how it operates as a low pass filter. [ 3 ]
- (c) Write short notes on any three of the following [ 9 ]
- Integrator
  - Active filter
  - Voltage Comparator
  - Current Mirror

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : PE-EC603D Information Theory & Coding

UPID : 006752

Time Allotted : 3 Hours

Full Marks : 70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) When will be the entropy of information source maximum?
- (II) What is the capacity of the ideal communication channel?
- (III) A code is with minimum distance  $d_{\min} = 5$ . How many errors can it detect?
- (IV) What is the relation of information ( $m_k$ ) of a message  $m_k$  with probability  $p_k$  ?
- (V) For a (n,k) code what is the value of code rate?
- (VI) A code is with minimum distance  $d_{\min} = 5$ . How many errors can it correct?
- (VII) What is the conditional probability for an error free channel?
- (VIII) What is a monic polynomial?
- (IX) What is a Deterministic Channel?
- (X) What is the capacity of a Binary Symmetric Channel?
- (XI) What is the capacity of a communication channel with a bandwidth of 4 kHz and 15 SNR?
- (XII) For generator polynomial  $g(x) = 1 + x^2 + x^3$  of a (7, 4) cyclic code the message word  $u = (1010)$ . Find the code vector.

## Group-B (Short Answer Type Question)

Answer any three of the following :

[ 5 x 3 = 15 ]

2. Verify that  $I(X; Y) = I(Y; X)$  [5]
  3. (a) Explain channel capacity theorem. [5]  
(b) Define channel capacity of the discrete memoryless channel.
  4. An analog signal having bandwidth B Hz is sampled at the Nyquist rate and the samples are quantized into four levels  $Q_1, Q_2, Q_3,$  and  $Q_4$  with probabilities of occurrence  $p_1 = p_2 = 3/5$ , and  $p_3 = p_4 = 2/5$ , respectively. The quantization levels are assumed to be independent. Find the information rate of the source. [5]
  5. Consider Table illustrating two binary codes having four symbols. Compare their efficiency. (M) [5]
- | $x_j$ | $P(x_j)$ | code 1 | code 2 |
|-------|----------|--------|--------|
| $x_1$ | 0.5      | 00     | 0      |
| $x_2$ | 0.25     | 01     | 10     |
| $x_3$ | 0.125    | 10     | 110    |
| $x_4$ | 0.125    | 11     | 111    |
6. A telegraph source produces two symbols, dash and dot. The dot duration is 0.2 s. The dash duration is 2 times the dot duration. The probability of the dots occurring is twice that of the dash, and the time between symbols is 0.1 s. Determine the information rate of the telegraph source. [5]

## Group-C (Long Answer Type Question)

Answer any three of the following :

[ 15 x 3 = 45 ]

7. (a) Consider a DMS with four source symbols encoded with four different binary codes as shown in Table. Show that all codes except code 2 satisfy the Kraft inequality [ 10 ]

$x_j$	code 1	code 2	code 3	code 4
$x_1$	0	00	0	0
$x_2$	01	10	11	100
$x_3$	10	11	100	110

- (b) codes 1 and 4 are uniquely decodable but codes 2 and 3 are not uniquely decodable [ 5 ]
8. State and prove Shannon-Hartley law. [ 15 ]
9. Let an alphabet consist of only four symbols A, B, C and D with probabilities of occurrence  $P(A) = 0.2$ ,  $P(B) = 0.2$ ,  $P(C) = 0.4$  and  $P(D) = 0.2$ . Find the arithmetic code for the message ABCCD [ 15 ]
10. An analog signal having 3 kHz bandwidth is sampled at 1.5 times the Nyquist rate. The successive samples are statistically independent. Each sample is quantized into one of 256 equally likely levels. [ 3+3+5+4 ]
- (a) Find the information rate of the source.
- (b) Is error-free transmission of the output of this source is possible over an AWGN channel with a bandwidth of 10 kHz and SNR of 20 dB.
- (c) Find the SNR required for error-free transmission for part (b).
- (d) Determine the bandwidth required for an AWGN channel for error-free transmission of the output of this source when the SNR is 20 dB
11. (a) Suppose a TV displays 30 frames/second. There are approximately  $2 \times 10^5$  pixels per frame, each pixel requiring 16 bits for colour display. Assuming an SNR of 25 dB calculate the bandwidth required to support the transmission of the TV video signal. [ 5+5+5 ]
- (b) An 8 kHz communication channel has an SNR of 30 dB. If the channel bandwidth is doubled, keeping the signal power constant, calculate the SNR for the modified channel.
- (c) Consider an optical communication system operating at  $\lambda$  800 nm. Suppose, only 1% of the optical source frequency is the available channel bandwidth for optical communication. How many channels can be accommodated for transmitting audio signals requiring a bandwidth of 8 kHz?

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : OE-EC804A Artificial Intelligence

UPID : 008300

Time Allotted : 3 Hours

Full Marks : 70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) Which function will select the lowest expansion node at first for evaluation?
- (II) What are the syntactic elements of First Order Logic?
- (III) What is Reasoning?
- (IV) What are the components of a problem?
- (V) What is the meaning of semantics?
- (VI) what is Artificial Intelligence ?
- (VII) What are the tasks of Artificial Intelligence?
- (VIII) Database Management System is not an application of AI: True/False
- (IX) A\* Search are informed search methods. True/False
- (X) Which search method will expand the node that is closest to the goal?
- (XI) What is Perceiving in AI ?
- (XII) The recognition system in AI is of how many types?

## Group-B (Short Answer Type Question)

Answer any three of the following :

[ 5 x 3 = 15 ]

2. List down all the characteristics of intelligent agent. [5]
3. How will you measure the problem-solving performance? [5]
4. Define First order Logic? Mention its uses. [5]
5. What is BFS? What is the application of BFS? [5]
6. What are semantic nets? Describe its feature. [5]

## Group-C (Long Answer Type Question)

Answer any three of the following :

[ 15 x 3 = 45 ]

7. a. Can there be more than one agent program that implements a given agent function? [ ]  
Give an example, or show why one is not possible. [ 3+3+3+3 ]  
b. Are there agent functions that cannot be implemented by any agent program? [ ]  
c. Given a fixed machine architecture, does each agent program implement exactly one agent function?  
d. Given an architecture with n bits of storage, how many different possible agent programs are there?  
e. Suppose we keep the agent program fixed but speed up the machine by a factor of two. Does that change the agent function?
8. Explain properties of environment with examples : [ ]  
a) Discrete vs Continuous [ 3+3+3+3 ]  
b) Deterministic vs Stochastic [ ]  
c) Single-agent vs Multi-agent  
d) Known vs Unknown  
e) Accessible vs Inaccessible
9. a) Define A.I [ 3+3+3+6 ]  
b) What is meant by robotic agent? [ ]  
c) Define rational agent?  
d) Give the general model of learning agent?
10. Explain in detail, the structure of following intelligent agents. Mention why they are called intelligent? [ 5+5+5 ]

- A. Simple Reflex Agents
- B. Model Based Reflex Agents
- C. Goal Based Agents

11. a. How can mini-max also be extended for game of chance? [ 5+5+5 ]  
b. What is environment program ? List the properties of environments.  
c. How agent should act?

\*\*\* END OF PAPER \*\*\*





# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : OE-EC803A Internet of Things(IoT)

UPID : 008339

Time Allotted : 3 Hours

Full Marks :70

*The Figures in the margin indicate full marks.*

*Candidate are required to give their answers in their own words as far as practicable*

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) What is the component of an IoT system that executes a program?
- (II) WOT reduces the \_\_\_\_\_ of HTTP.
- (III) What do API systems enable?
- (IV) What is the last step of reliable data transfer?
- (V) Service is termed as \_\_\_\_\_ in SOA.
- (VI) What is the format of IP address?
- (VII) What is the full form of DHCP in IoT communication protocols?
- (VIII) The address of the original IEEE 802 MAC comes from \_\_\_\_\_.
- (IX) LTE stands for
- (X) What role of the cloud in smart grid architecture is?
- (XI) The standard length of the MAC address is \_\_\_\_\_.
- (XII) Arduino IDE is written in which programming language?

## Group-B (Short Answer Type Question)

Answer any three of the following :

[ 5 x 3 = 15 ]

2. Discuss static and dynamic IP address assignment. [5]
3. Explain the use of TCP and UDP ports. Give examples. [5]
4. Discuss, what are the benefits of using IPV6 in IOT? [5]
5. Describe use of IP, TCP and UDP protocols. [5]
6. What do you mean by BLE (Bluetooth Low Energy)? [5]

## Group-C (Long Answer Type Question)

Answer any three of the following :

[ 15 x 3 = 45 ]

7. Explain various trend in Information and communication technologies and its impact on IoT. [ 15 ]
8. Explain the functional layers and capabilities of an IoT solution with a neat diagram. [ 15 ]
9. Explain an information driven value chain for IoT with a neat diagram. [ 15 ]
10. Explain the generic M2M System Solution with a neat diagram. [ 15 ]
11. Explain ETSI M2M service capabilities in detail with a neat diagram. [ 15 ]

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : OE-EC604C Object Oriented Programming

UPID : 006602

Time Allotted : 3 Hours

Full Marks : 70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) What does a class in C++ holds?
- (II) What is the role of a constructor in classes?
- (III) What is the syntax of overloading operator + for class A?
- (IV) How many specifiers are used to derive a class?
- (V) \_\_\_\_ used to create a pure virtual function.
- (VI) Which is used to create an output stream?
- (VII) Where does the object is created?
- (VIII) How many parameters does a default constructor require?
- (IX) Which of the following operator cannot be overloaded?
- (X) If a class is derived privately from a base class then \_\_\_\_\_
- (XI) How structures and classes in C++ differ?
- (XII) An inline function is expanded during \_\_\_\_\_

## Group-B (Short Answer Type Question)

Answer any three of the following :

[ 5 x 3 = 15 ]

2. What is the hierarchy of file stream classes? [5]
3. Explain about public inheritance with an example. [5]
4. How to create reference variable in c++? [5]
5. Define object oriented programming concepts. [5]
6. Differentiate between binary and unary operators which can be overloaded. [5]

## Group-C (Long Answer Type Question)

Answer any three of the following :

[ 15 x 3 = 45 ]

7. (a) Why access specifiers are used? [ 5 ]  
(b) Write a program by using friend function to find out the Fibonacci series of n terms. [ 5 ]  
(c) What is static members? [ 5 ]
8. (a) Write a program to show an arithmetic exception. How to handle it? [ 5 ]  
(b) Why template is used in c++? [ 3 ]  
(c) Differentiate between class template and function template with proper examples. [ 7 ]
9. (a) What do you mean by virtual destructor? [ 5 ]  
(b) What are the uses of this pointer? [ 5 ]  
(c) What do you mean by run time polymorphism? [ 5 ]
10. (a) Differentiate between default and argumental constructors. [ 5 ]  
(b) How constructors can be used with dynamic allocation? [ 5 ]  
(c) Why constructors are used to initialize an Object? [ 5 ]
11. (a) Write a program to find out all prime numbers between 1 to 100. Apply copy constructor also in your program. [ 6 ]  
(b) Differentiate between function and constructor. [ 5 ]  
(c) Define destructors with an example. [ 4 ]

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : HM-601/HM-EE601/HM-EEE601/HM-HU601/HS-HU601 Economics for Engineers

UPID : 006621

Time Allotted : 3 Hours

Full Marks :70

*The Figures in the margin indicate full marks.*

*Candidate are required to give their answers in their own words as far as practicable*

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following : [ 1 x 10 = 10 ]
- (I) Project A has a Benefit-Cost Ratio=1.13. An alternative, Project B has a Benefit-Cost Ratio=1.23. Which project should be selected?
  - (II) What is expected value?
  - (III) In which method, the amount of depreciation remains unchanged?
  - (IV) For a project to be financially viable what should be the value of the profitability index ?
  - (V) What is the difference between recurring and non recurring cost?
  - (VI) What is MARR?
  - (VII) Fill in the blank: Break even analysis is a type of \_\_\_\_\_ analysis.
  - (VIII) What is a decision node?
  - (IX) What is the full form of FVIF?
  - (X) What is an intangible asset?
  - (XI) To compute the updated cost of a boiler in same year but of new capacity, what measure should we should ideally use?
  - (XII) What is the difference between Internal Rate Of Return and Return on Investment?

## Group-B (Short Answer Type Question)

Answer any three of the following : [ 5 x 3 = 15 ]

2. How is cost index model used in estimation of cost? [5]
3. What do you understand by time value of money? [5]
4. Calculate Working Capital, Current ratio and Quick ratio from the following information: [5]  
Stock= Rs. 50,000; Debtors= Rs 41,000; Bills receivable= Rs. 9000; Advance tax= Rs. 4,000; Cash =Rs33,000; Bills payable = Rs 37,000; creditors =Rs 60,000 and bank overdraft = Rs 3000.
5. What do you understand by Economic Decision Trees? [5]
6. What do you understand by Profit-Volume Ratio? Explain. [5]

## Group-C (Long Answer Type Question)

Answer any three of the following : [ 15 x 3 = 45 ]

7. (a) The Alpha Drug Company has just purchased a capsule machine for Rs. 20,00,000. The plant engineer estimates that the machine has a useful life of five years and a salvage value of Rs. 25,000 at the end of its useful life. Compute the depreciation schedule for the machine by straight line method. [ 7 ]
- (b) An automobile company has purchased a wheel alignment device for Rs. 10,00,000. The device can be used for 15 years. The salvage value at the end of the life of the device is 10% of the purchase value. Find the depreciation at the end of the seventh year using the double declining balance method of depreciation. [ 8 ]
8. (a) The maintenance cost of an equipment is nil in the first year but there after increases by Rs. 150 every year. The revenue from the equipment is Rs. 2000 in first year and there after decreases by Rs. 250 every year. Find net annual equivalent if interest rate is 6 % and the equipment has a 10 year life. Suggest if the equipment is financially viable. [ 10 ]
- (b) A savings and loan offers a nominal interest rate of 5.25% rate per annum compounded daily over 365 days per year. What is the effective annual rate? [ 5 ]
9. (a) A manufacturer of motor cycles buys side boxes at Rs. 240 each. In case he makes it himself, the fixed and variable costs would be Rs. 3,00,000 and Rs. 90 per side box respectively. Should the [ 7 ]

manufacturer make or buy  
the side boxes if the demand is 2,500 side boxes?

(b) Consider the following data of a company for a particular financial year: [ 8 ]

Sales = Rs. 2,40,000

Fixed cost = Rs. 50,000

Variable cost = Rs. 75,000

Find the following:

(i) Contribution

(ii) Profit

(iii) BEP

(iv) Margin of safety

10. (a) What is incremental cost? What do you understand by life cycle cost? [ 6 ]

(b) Distinguish between per unit model and segmenting model. Discuss the advantages and disadvantages in both methods of cost estimation. [ 6 ]

(c) Distinguish between cash cost vs book cost. [ 3 ]

11. (a) Define 'economic life' of an equipment. [ 3 ]

(b) A firm is considering replacement of an equipment, whose first cost is Rs. 1,750 and the scrap value is negligible at any year. Based on experience, it was found that the maintenance cost is zero during the first year and it increases by Rs. 100 every year thereafter. When should the equipment be replaced if  $i = 0\%$ ? [ 12 ]

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : PE-EC801B Fibre Optic Communication

UPID : 008329

Time Allotted : 3 Hours

Full Marks : 70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) What are the sources used in optical communication?
- (II) What material is used in electro-optic modulators and switches?
- (III) The material for making an efficient LED should be-----
- (IV) Does Self-phase modulation causes modifications to the pulse spectrum?
- (V) Define Acceptance angle of an optical fiber.
- (VI) What is the unit of measurement of the optical attenuation per unit length?
- (VII) Which detector material is most often used in 1550 nm window?
- (VIII) Which is the most common method for manufacturing couplers?
- (IX) What are passive components in WDM?
- (X) In Kerr effect, induced index change has its proportionality with respect to \_\_\_\_\_
- (XI) In spontaneous emission, the light source in an excited state undergoes the transition to a state with \_\_\_\_\_
- (XII) In the fiber optic link, power transfer from one fiber to another and from fiber to detector must take place with \_\_\_\_\_ coupling efficiency.

## Group-B (Short Answer Type Question)

Answer any three of the following :

[ 5 x 3 = 15 ]

2. Discuss the attenuation characteristics of a SMF. What are the three different wavelength windows used in optical fiber communication? [ 5 ]
3. Briefly outline the advantages and drawbacks of the LED in comparison with the injection laser for use as a source in optical fiber communications. [ 5 ]
4. Explain waveguide dispersion. What are dispersion-flattened fibres? [ 5 ]
5. Establish the threshold gain condition for lasing to occur in a fabry-perot resonator based laser diode. [ 5 ]
6. Discuss the impact ionization in avalanche photodiode. [ 5 ]

## Group-C (Long Answer Type Question)

Answer any three of the following :

[ 15 x 3 = 45 ]

7. (a) Draw the block diagram of general communication system and fiber optics communication system? Explain in detail. [ 10 ]
- (b) Explain the advantages of an Optical Communication system. [ 5 ]
8. (a) Explain what is meant by a graded index optical fiber, giving an expression for the possible refractive index profile. Explain the light propagation mechanism in graded index fiber. [ 7 ]
- (b) What is V number of fiber or normalized frequency of fiber? Define cutoff wavelength of the fiber. [ 4 ]
- (c) A multimode step index fiber with a core diameter of 80  $\mu\text{m}$  and a relative index difference of 1.5% is operating at a wavelength of 0.85  $\mu\text{m}$ . If the core refractive index is 1.48, estimate: (i) the normalized frequency for the fiber; (ii) the number of guided modes. [ 4 ]
9. (a) Briefly discuss with the aid of a suitable diagram what is meant by the acceptance angle for an optical fiber. [ 3 ]
- (b) Define Numerical aperture of a step index fiber. Obtain an expression for it. [ 5 ]
- (c) Explain Mode-field diameter. [ 3 ]
- (d) A silica optical fiber with a core diameter large enough to be considered by ray theory analysis has a core refractive index of 1.50 and a cladding refractive index of 1.47. Determine: (a) the critical [ 4 ]

angle at the core-cladding interface; (b) the NA for the fiber; (c) the acceptance angle in air for the fiber.

10. (a) Discuss with the aid of a suitable diagram one melting method for the preparation of multicomponent glass. [ 5 ]
- (b) Briefly describe the major reasons for the cabling of optical fibers which are to be placed in a field environment. [ 5 ]
- (c) Explain the working principle of optical time domain reflectometer (OTDR). [ 5 ]
11. (a) Mention the criteria for choosing the photo detectors for optical communication. [ 5 ]
- (b) Define Responsivity and Quantum efficiency of a photo detector. Derive an expression for the Responsivity of an intrinsic photodiode in terms of Quantum Efficiency and the wavelength of the incident radiation. [ 7 ]
- (c) When  $3 \times 10^{11}$  photons each with wavelength  $0.85 \mu m$  are incident on a photodiode, on average  $1.2 \times 10^{11}$  electrons are collected at the terminals of the device. Determine the quantum efficiency and responsivity of the photodiode at  $0.85 \mu m$ . [ 3 ]

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : ES-CS401/PCC-CS 404/PCC-CS404/PCC-CSD 402/PCCCS404 Design & Analysis of Algorithms

UPID : 004416

Time Allotted : 3 Hours

Full Marks : 70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

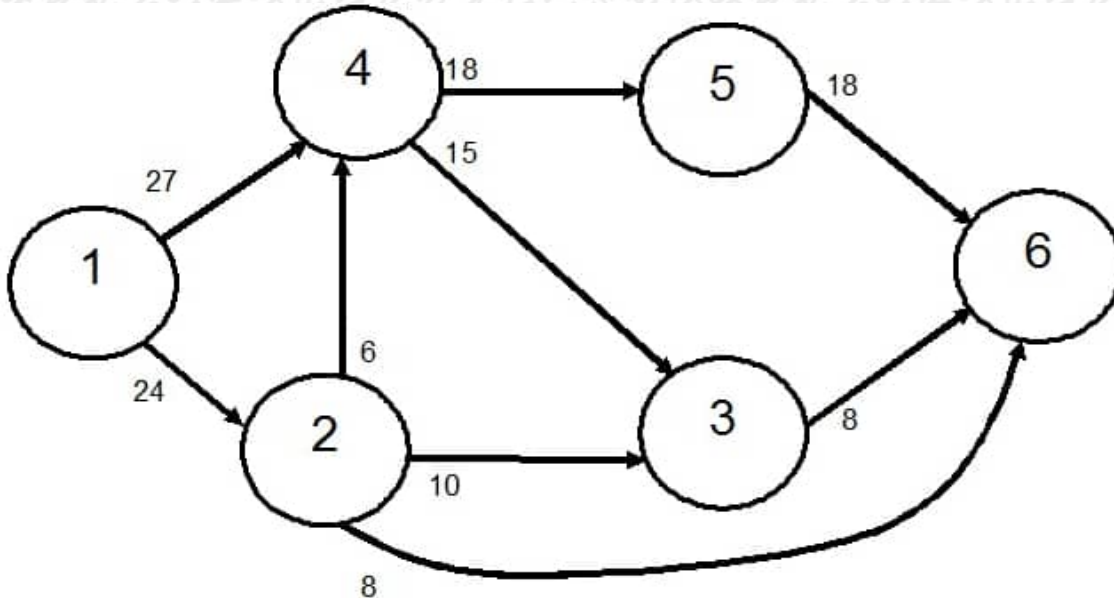
- (I) State True/False: Approximation algorithm guaranties the best quality of solution.
- (II) State True/False:  $O(\log n) > O(n)$
- (III) What is the time complexity of Knapsack algorithm using Greedy method?
- (IV) State True/ False: Adjacency matrix and Path Matrix are same.
- (V) State True/ False: Ordered searching algorithm is a Polynomial Algorithm.
- (VI) State True/False: Brute Force method gives the best quality of solution.
- (VII) State True/ False: Travelling Salesman Problem is a Non-Polynomial problem.
- (VIII) Name one heuristic method of searching.
- (IX) Best case time complexity of Binary search algorithm is \_\_\_\_\_
- (X) The time complexity of Floyd's algorithm is \_\_\_\_\_
- (XI) Backtracking follows \_\_\_\_\_ traversal technique.
- (XII) What is spanning tree?

## Group-B (Short Answer Type Question)

Answer any three of the following :

[ 5 x 3 = 15 ]

2. Write down an algorithm to solve the Job Sequencing with Deadline Problem using Greedy method. What is the time complexity of your algorithm? [5]
3. Find the maximum flow of the following network. Mention each step clearly. [5]



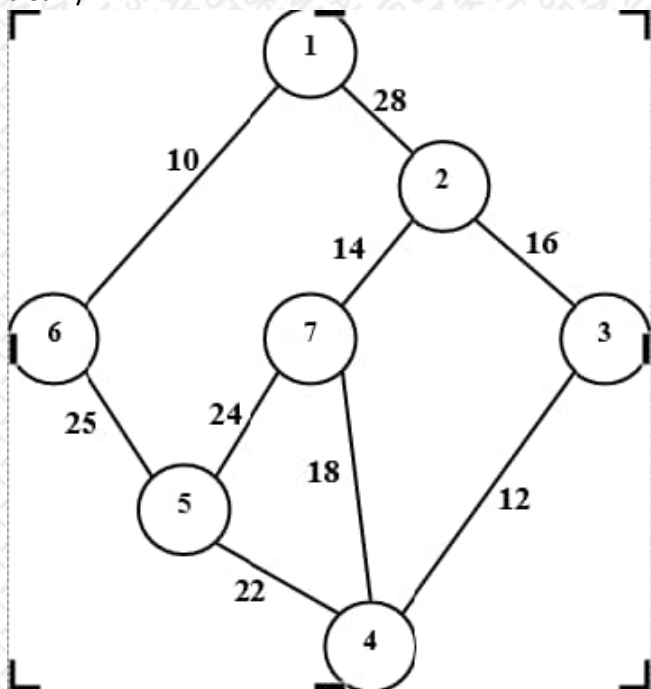
4. Write down an algorithm in Greedy method to find the minimum spanning tree by Prim's algorithm. What is the time complexity of your algorithm? [5]
5. (a) State Cook's Theorem. [5]  
(b) Define Clique with example.
6. Define the following terms: [5]  
(i) Brute Force Algorithm

**Group-C (Long Answer Type Question)**

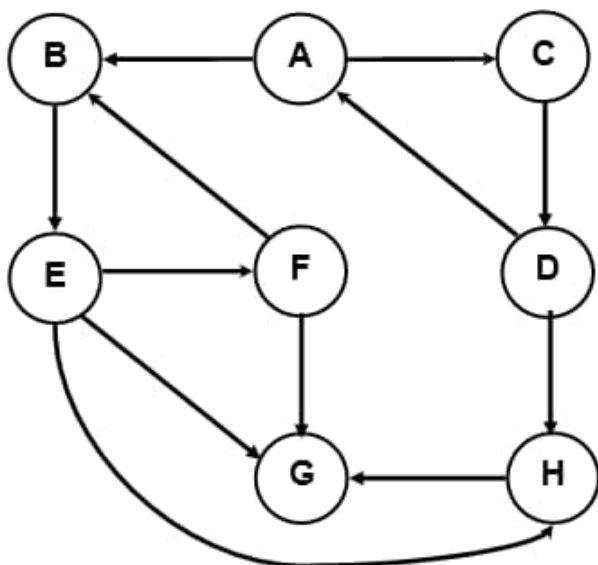
Answer any three of the following :

[ 15 x 3 = 45 ]

7. (a) Find the minimum spanning tree using Prim's method from the following graph. Mention each step clearly. [ 6 ]



- (b) Write an algorithm to find all solutions of N-Queens problem using backtracking. [ 4 ]  
(c) What is the time complexity of your algorithm? [ 1 ]  
(d) Write an algorithm to find all pairs shortest path using Floyd's method. [ 4 ]
8. (a) Write down an algorithm of Quick Sort. [ 5 ]  
(b) Derive the best, worst and average case time complexity of your algorithm. [ 2+3+5 ]
9. (a) Find the minimum number of scalar operation needed to multiply the matrices A1, A2, A3 and A4 having dimensions 30x35, 35x15, 15x5 and 5x10 respectively. [ 5 ]  
(b) Write down an algorithm using Greedy method to find minimum spanning tree by Krushkal's algorithm. [ 5 ]  
(c) Find the time complexity of your algorithm. [ 3 ]  
(d) Differentiate between Backtracking and Branch and Bound. [ 2 ]
10. (a) Find the transitive closure of vertex A from the following graph: [ 3 ]



- (b) Define the following terms: [ 12 ]  
(i) Directed graph  
(ii) Undirected graph



(iii) In-Degree and Out-Degree

(iv) Complete Graph

(v) Articulation Point

(vi) Bridge

11. (a) Differentiate between recursion and iteration.

[ 3 ]

(b) Find the time complexity of the following recurrence relations using Master's Theorem.

[ 4+4 ]

(i)

$$T(n) = 2T\left(\frac{n}{4}\right) + n^{0.51}$$

(ii)

$$T(n) = \sqrt{2}T\left(\frac{n}{2}\right) + \log n$$

(c) (c) Define little omega notation. Explain with an example.

[ 2+2 ]

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : EC403 Microprocessor & Microcontrollers

UPID : 004430

Time Allotted : 3 Hours

Full Marks : 70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) What is an opcode?
- (II) What is the use of ALE?
- (III) What is a microcomputer?
- (IV) What is the microcontroller and microcomputer?
- (V) What is meant by wait state?
- (VI) How many interrupts does 8085 have mention them
- (VII) What is memory mapping?
- (VIII) What is I/O mapping?
- (IX) Give the register organization of 8085?
- (X) What is interfacing?
- (XI) How the 8085 processor differentiates a memory access (read/write) and I/O access (read/write)?
- (XII) Why status signals are provided in microprocessor?

## Group-B (Short Answer Type Question)

Answer any three of the following :

[ 5 x 3 = 15 ]

2. What is vectored and Non- Vectored interrupt? [5]
3. What is masking and why it is required? [5]
4. What are the operations performed by ALU of 8085? [5]
5. Which interrupt has highest priority in 8085? What is the priority of other interrupts? [5]
6. Where is the READY signal used? [5]

## Group-C (Long Answer Type Question)

Answer any three of the following :

[ 15 x 3 = 45 ]

7. Explain the features of 8085 in detail. [ 15 ]
8. (a) How does the microprocessor differentiate among positive number, a negative number and a bit pattern? [ 5 ]
- (b) List the components of microprocessor (single board microcomputer) based system [ 5 ]
- (c) Define machine cycle. [ 5 ]
9. Write an assembly language program to convert a two digit BCD(8-bit) data to binary data. [ 15 ]
10. Explain timing diagram in details [ 15 ]
11. Draw the Timing diagram for INR M [ 15 ]

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : EC602/PCC-CS602/PCCCS602 Computer Networks

UPID : 006596

Time Allotted : 3 Hours

Full Marks : 70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) Remote login protocol is known as \_\_\_\_\_
- (II) What is meant by protocol in computer network?
- (III) Layer-2 Switch is also called \_\_\_\_\_
- (IV) Each IP packet must contain \_\_\_\_\_.
- (V) Token bucket algorithm is an advanced form of \_\_\_\_\_
- (VI) Mail transfer protocol is known as \_\_\_\_\_.
- (VII) IP address of Loop back address is \_\_\_\_\_.
- (VIII) What are the two categories of QoS attributes?
- (IX) Three main division of the domain name space are \_\_\_\_\_.
- (X) State the function of application Layer in brief.
- (XI) Receiving window of selective repeat ARQ is \_\_\_\_\_.
- (XII) Why IP Protocol is considered as unreliable?

## Group-B (Short Answer Type Question)

Answer any three of the following :

[ 5 x 3 = 15 ]

2. Explain the functions of physical layer and Data link layer in brief. [5]
3. Compare between CSMA/CD and CSMA/CA [5]
4. Explain [5]
  - i. Repeater
  - ii. Router
  - iii. Gateway
5. How does firewall protect data? [5]
6. What is meant by bit stuffing and why it is used? [5]

## Group-C (Long Answer Type Question)

Answer any three of the following :

[ 15 x 3 = 45 ]

7. (a) Discuss the working of Twisted pair cable [ 7 ]  
(b) What is optical fiber? State the advantages of using optical fiber in computer network. [ 8 ]
8. (a) Write short notes on: (i) Protocol using selective repeat (ii) Stop and Wait protocol [ 8 ]  
(b) Discuss about VRC with an example. [ 7 ]
9. (a) Explain token bucket algorithm [ 7 ]  
(b) Draw the TCP header and explain its parts [ 8 ]
10. (a) Compare between static and dynamic routing. [ 8 ]  
(b) Explain the concept of RIP. [ 7 ]
11. (a) Explain how FTP can be used to browse website? [ 7 ]  
(b) Discuss about the Bluetooth architecture and protocols involved during Bluetooth enabled network. [ 8 ]

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : EC601 Control System & Instrumentation

UPID : 006637

Time Allotted : 3 Hours

Full Marks : 70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) Write one advantage of proportional controller.
- (II)  $G(S)H(S) = \{1 / (5+S) (6+S)\}$  Find  $K_p$ .
- (III) Define stability.
- (IV) Define state equation.
- (V) What is limit cycle?
- (VI) For any electrical signal, the measurement of energy distribution in frequency domain is done by which instruments?
- (VII) What is continuous time system?
- (VIII) Write one advantage of proportional plus integral controller.
- (IX)  $G(S)H(S) = \{1 / S(5+S) (6+S)\}$  Find  $K_v$ .
- (X) What is bandwidth?
- (XI) Define non touching loop.
- (XII) What is relative stability?

## Group-B (Short Answer Type Question)

Answer any three of the following :

[ 5 x 3 = 15 ]

2. Explain proportional controller with an example [5]
3.  $G(S)H(S) = \{1 / (20+S) (50+S)\}$  Find  $K_p$  [5]
4. Explain proportional plus derivative controller with an example. [5]
5. Explain lead compensation. [5]
6. Explain lead – lag compensation. [5]

## Group-C (Long Answer Type Question)

Answer any three of the following :

[ 15 x 3 = 45 ]

7. Explain PID controller with an example. [ 15 ]
8.  $C(s)/ R(s) = 25 / (S^2+6S+25)$  Determine the characteristics equation, natural frequency, damping factor, damped frequency of oscillation, peak time, maximum overshoot, the time at which 1st undershoot occurs, time period of oscillation, number of cycles completed before the steady state. [ 15 ]
9. State Routh Stability Criterion. [ 15 ]  
Comment on the stability of a closed loop system whose characteristic equation is  $S^3+2S^2+3S+1=0$
10. Consider a feedback system with characteristics equation  $\{1 + K / (S+1) (s+2)\} = 0$ ;  $K \geq 0$ . Draw root locus. [ 15 ]
11. Consider a feedback system with characteristics equation  $\{1 + K / S(S+3) (S^2+2S+2)\} = 0$ ;  $K \geq 0$ . Draw root locus. [ 15 ]

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : PE-EC603C CMOS VLSI Design

UPID : 006751

Time Allotted : 3 Hours

Full Marks : 70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) Name the oxide material which is used as a gate oxide layer in the MOSFET.
- (II) What is diffusion process in VLSI fabrication?
- (III) In CMOS logic circuit the n-MOS transistors act as \_\_\_\_\_ Network.
- (IV) What is interconnect delay?
- (V) What is SPLD?
- (VI) Name the material that is used for gate electrode of MOSFET?
- (VII) What type of bias is to be given for a n-channel enhancement type MOSFET ?
- (VIII) What is ingot?
- (IX) How many transistors will be required to implement a X-input dynamic CMOS logic?
- (X) What do you mean by Global Routing?
- (XI) What is the output of physical design ?
- (XII) What is the unit of trans-conductance parameter of MOSFET ?

## Group-B (Short Answer Type Question)

Answer any three of the following :

[ 5 x 3 = 15 ]

2. Discuss the principle of operation of MOSFET [5]
3. What are the advantages of using SiO<sub>2</sub> in VLSI circuits? Write down Fick's equations (one dimension) for diffusion. [5]
4. Describe three design domains in VLSI using Y-chart. [5]
5. Briefly Explain the Narrow channel effects in MOSFET? [5]
6. Describe Photolithography process with diagram. [5]

## Group-C (Long Answer Type Question)

Answer any three of the following :

[ 15 x 3 = 45 ]

7. (a) State Moore's law. What are the advantages of using CMOS compared to BJT. [ 5 ]  
(b) What do you mean by hierarchy, regularity, modularity & Locality of any VLSI design. [ 6 ]  
(c) Explain the features of ASIC [ 4 ]
8. (a) Explain the principle of operation of n- channel MOSFET . [ 8 ]  
(b) Draw the MOSFET I-V Characteristics and explain the different regions. [ 7 ]
9. (a) Discuss Different types of Small Geometry effects in a MOSFET. [ 12 ]  
(b) Explain different Narrow channel effects in MOSFET? [ 3 ]
10. (a) With suitable diagram describe the nMOS fabrication process . [ 10 ]  
(b) Briefly explain about etching process. [ 5 ]
11. (a) Explain the different steps of twin tub CMOS process of fabrication using n-well and p-well. [ 10 ]  
(b) Explain the fabrication of SiO<sub>2</sub> using the dry oxidation technique. [ 5 ]

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : BS-B401/BSC 401/BSC-401/BSC401 Biology

UPID : 004408

Time Allotted : 3 Hours

Full Marks :70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) Discuss how the classification system has undergone several changes over a period of time.
- (II) The process of transfer of hereditary character from one generation to another is known as.....?
- (III) Name the Vitamins whose deficiency cause i) rickets ii) scurvy
- (IV) Define enzymes with suitable example.
- (V) Name the enzyme that transcribes hnRNA in eukaryotes.
- (VI) How many essential amino acids are in the nature?
- (VII) What are imperfect fungi?
- (VIII) A sudden change in the gene which is heritable from one generation to other is known as\_\_\_\_\_.
- (IX) Why carbohydrates are generally optically active?
- (X) Name few of the enzyme secreted by pancreas?
- (XI) Diatoms are also called 'pearls of the ocean'. Why?
- (XII) Which of the following process is an exception of Mendel Law?
  - A. Mutation
  - B. Variation
  - C. Cloning
  - D. Linkage

## Group-B (Short Answer Type Question)

Answer any three of the following :

[ 5 x 3 = 15 ]

2. Differentiate between aminotelic, uricotelic, ureotelic organisms [5]
3. Differentiate between Meiosis and Mitosis [5]
4. Differentiate between prokaryotic and eukaryotic cell [5]
5. Explain Epistasis with suitable example. [5]
6. In catalyzed reactions, the formation of the enzyme-substrate complex is the first step. Explain the other steps until the formation of the product. [5]

## Group-C (Long Answer Type Question)

Answer any three of the following :

[ 15 x 3 = 45 ]

7. Give characteristics of *E.coli*, *S. cerevisiae*, *D. Melanogaster* as model organisms [ 15 ]
8. explain the Hierarchy of DNA structure- from single stranded to double helix to nucleosomes [ 15 ]
9. How will you convey that Biology is as important a scientific discipline as Mathematics, Physics and Chemistry [ 15 ]
10. Give characteristics of *C. elegance*, *A. Thaliana*, *M. musculus* as model organisms [ 15 ]
11. Explain how competitive , un competitive and non competitive inhibitors act on  $k_m$  and  $v_{max}$ . [ 15 ]

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : BS-M401/M(CS) 401/M(CS)401 Numerical Methods(BS)

UPID : 004401

Time Allotted : 3 Hours

Full Marks :70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) What is the number of significant figures in 0.3409 ?
- (II) What is the relation between shift operator and central difference operator?
- (III) What is the advantage of Lagrange's interpolation?
- (IV) What type of interval is used for Trapezoidal rule?
- (V) Find an interval where the positive root of the equation  $x + \ln x - 2 = 0$ ?
- (VI) Find the inverse of the matrix  $\begin{pmatrix} 1 & -1 & 1 \\ 1 & 1 & 1 \\ 1 & 2 & 4 \end{pmatrix}$ ?
- (VII) What represents the Lagrange Interpolation formula for two points of interpolation?
- (VIII) What type of interval used for simpson's 1/3 rule?
- (IX) Write one disadvantage of Bisection method?
- (X) What is the order of truncation error in Euler's Method order?
- (XI) What is the relation between forward difference operator and backward difference operator?
- (XII) What represents the Lagrange Interpolation formula for two points of interpolation?

## Group-B (Short Answer Type Question)

Answer any three of the following :

[ 5 x 3 = 15 ]

2. Find the absolute, relative and percentage error if  $5/6$  is approximated by .8333. [5]
3. Find the missing terms from the following table: [5]

$x:$	0	1	2	3	4	5
$f(x):$	0	-	8	15	-	35

4. From the given table find  $f(x)$  and  $f(6)$  [5]

$x:$	0	1	2	3	4	5
$f(x):$	41	43	47	53	61	71

5. Derive the Lagrange's interpolation formulae. [5]
6. Prove that  $\mu^2 = 1 + \frac{1}{4}\delta^2$ , where the notations have their usual meaning. [5]

## Group-C (Long Answer Type Question)

Answer any three of the following :

[ 15 x 3 = 45 ]

7. (a) Give a geometrical interpretation of Newton Raphson method [ 7+8 ]  
(b) Find a root of the equation  $x \sin x + \cos x = 0$  using Newton Raphson method correct upto 5 places of decimal
8. Apply Lagrange's interpolation formula to find  $f(x)$ , if  $f(1) = 2$ ,  $f(2) = 4$ ,  $f(3) = 8$ ,  $f(4) = 16$  and  $f(7) = 128$ . [ 7+8 ]  
Find  $f(2.5)$  using Newton forward difference formula for the given data

$x$	1	2	3	4	5	6
$f(x)$	0	1	8	27	64	125

9. [ 7+5+3 ]

If  $\Delta r = \Delta h = 0.1$  find the Absolute error, Relative error up to three significant errors in  $V = \frac{1}{3} \pi r^2 h$

when  $r=2, h=3$ .

If 3.45234 be an approximate value of 3.45678, find the Absolute, Relative, Percentage errors.

Round off the following number upto four significant figures

(i) 170.570 (ii) 21753.

10. [ 5+5+5 ]

Prove that  $\Delta + \nabla = \frac{\Delta}{\nabla} - \frac{\nabla}{\Delta}$

Prove that  $\Delta - \nabla = \Delta \nabla$

Find the missing term of the following table

x	2	4	6	8	10
y	5.6	8.6	13.9	-----	35.6

11. (a) Interpret Regula-Falsi method geometrically. [ 5+5+5 ]

(b) Compute a real root of the equation  $3x - \cos x - 1 = 0$  by bisection method correct to five significant figure.

(c)

Find  $\sqrt[4]{27}$  by Newton-Raphson method

\*\*\* END OF PAPER \*\*\*





# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : PC-EE 602/PC-EEE-602 Micro processor & micro controller

UPID : 006608

Time Allotted : 3 Hours

Full Marks :70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) What is the size of the queue in Intel 8086 microprocessor?
- (II) How many bus cycles are used by the Intel 8086 processor to read a word from an odd address in memory?
- (III) If an Intel 8086 based system has a total 64 K bytes of ROM memory in it then what should be one of the ROM memory location addresses available in this system?
- (IV) Amongst the two possible architectures, Von Neumann architecture and Harvard architecture, which one is followed by Intel 8051 microcontroller?
- (V) How many 8-bit parallel I/O ports are available in Intel 8051?
- (VI) The instruction JE NEXT , where NEXT is a label, causes the processor to jump in which condition?
- (VII) What is the addressing mode in the instruction ADD BL, DS:23H[BP][SI] ?
- (VIII) 

```
MOV SP, 3012H
PUSH AX
```

What will be the new value in SP register after the above two instructions?
- (IX) What will be the control word that should be sent to 8255A to configure Port A as input in mode 0, Port B as output in mode 1 and remaining lines of Port C as output in mode 0?
- (X) Which bit of the flag register is set when output overflows to the sign bit?
- (XI) PIC 18 is a 8-bit microcontroller or 16-bit microcontroller?

## Group-B (Short Answer Type Question)

Answer any three of the following :

[ 5 x 3 = 15 ]

2. Explain with diagrams the IO mode control word Intel 8255A. [5]
3. With a neat diagram discuss the memory structure of Intel 8051 microcontroller. [5]
4. Write an ALP using 8051 instruction set, to load 25H and 34H in R2,R7 register respectively and store the Multiplication result of contents of R2 and R7 register in external RAM 0005H. [5]
5. Draw the timing diagram of a memory read cycle by Intel 8086 processor. Explain the signals. [5]
6. Describe Mode 3 in 8253 with timings diagram. [5]

## Group-C (Long Answer Type Question)

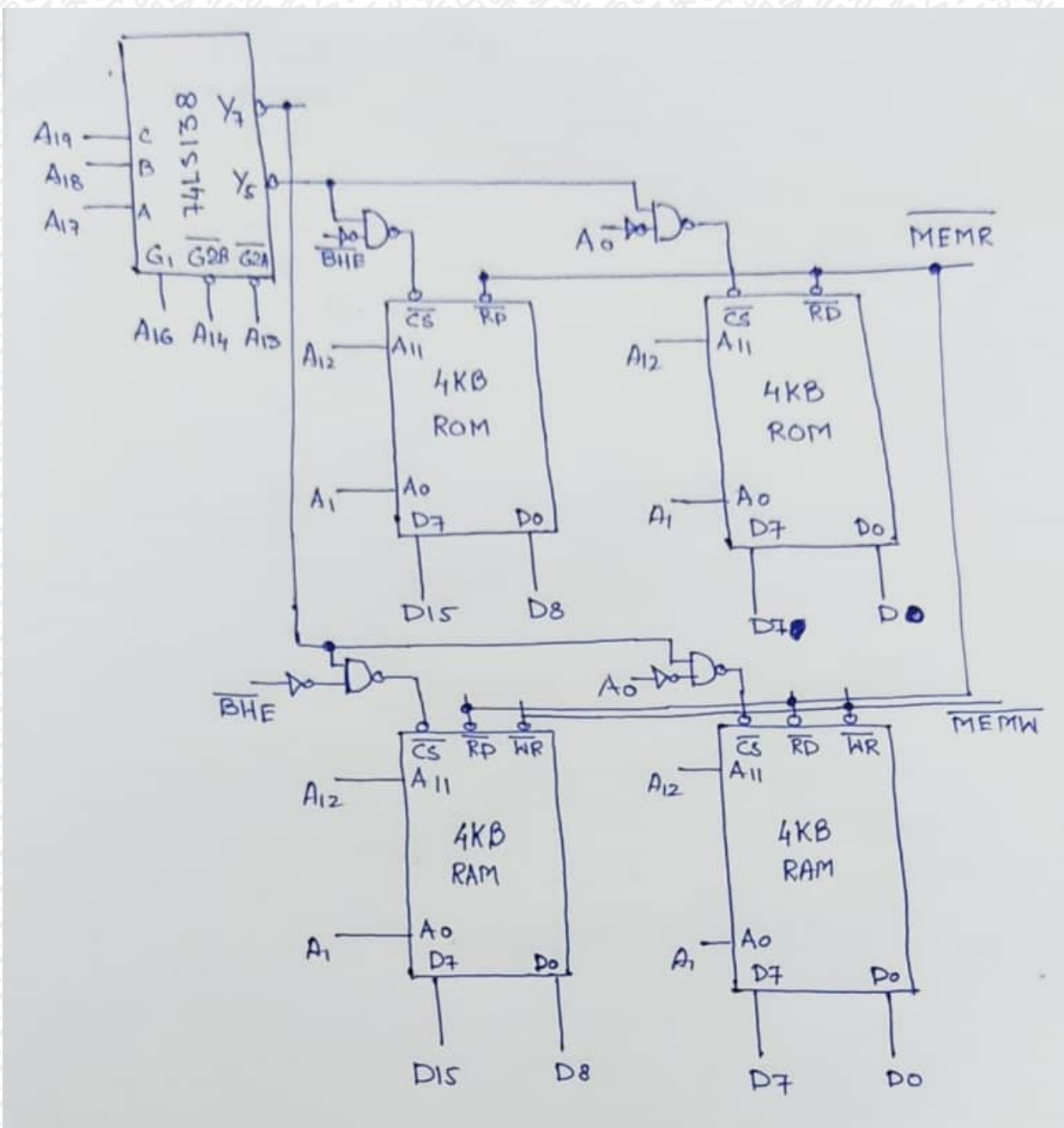
Answer any three of the following :

[ 15 x 3 = 45 ]

7. a) List the sequence of steps that the 8086 processor will go through when it will receive an interrupt signal on the INTR line. Assume a 8259A is connected to the system. [ 5+10 ]  
 b) Show how three 8259A s can be connected to the system where one is master and other two are slaves. Show only the connections of INTR, INTA' signals from the microprocessor side and IR signals and INT signals from 8259A side. No need to show the address decoding for chip select and connections of the data bus.
8. a) What operation will be performed by the Intel 8086 processor when it will execute ADD AL, 23H[BP][SI] instruction? Assume some arbitrary values for the contents of the internal registers involved in the operation. [ 3+2+10 ]  
 b) If (AL) = 23H and (BL) = 43H then what will be the new contents of these registers and state of CF after the execution of CMP AL,BL instruction. Explain your answer.  
 c) Two arrays of 8-bit numbers are present in memory at offsets 1012H and 3A97H respectively in the logical segment starting at 0A2B0H in memory. Length of both array is 20. Write a program for the 8086 processor which will add each element of the first array with the corresponding element of the second array and store the result in a third array in memory from offset A24BH. Assume that always the result of addition will be within 8-bits.

You can write the program using assembler directives or without using assembler directives as per your choice. If you are using assembler directives, then no need to include statements to declare or define data items for the program.

9. a) What is the purpose of the instruction register? [ 5+5+5 ]  
 b) State the purpose of ALE/PROG signal.  
 c) State the difference between program memory and data memory.
10. a) Write a program for 8051 to save the status of bits p1.2 and p1.3 on ram bit locations 6 and 7 [ 5+5+5 ] respectively.  
 b) Two packed 2-digit BCD numbers are there in memory locations 30H and 31H of the internal RAM. Write a program for 8051 to add these numbers. Store the result at address 50H of the internal RAM and the carry ( if any) at 51H.
11. a) Describe what happens on external bus signals when 8086 reads a word of data from an even address [ 5+10 ] and odd address.  
 b) See the following figure showing interfacing of two 4 Kbytes ROM ICs and two 4 Kbytes RAM ICs with Intel 8086 processor. 74LS138 is a 3-8 decoder having three inputs A,B,C, seven active low outputs Y7-Y0, active high G1 enable signal and active low G2B', G2A' enable signals. Calculate all possible addresses of the resulting 8 Kbytes of ROM memory and 8 Kbytes of RAM memory present in the system.



\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : PC-EE 801 Utilization of Electric Power

UPID : 008387

Time Allotted : 3 Hours

Full Marks : 70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) Magnetic materials are heated with the help of \_\_\_\_\_ loss.
- (II) Can A.C. welding machine be used for MIG welding?
- (III) The voltage applied to the electrodes for electroplating is in the range of \_\_\_\_\_ .
- (IV) In electric traction, if contact voltage exceeds 1500 V, then which kind of electrification system is used?
- (V) Filament lamps operate normally at a power factor of \_\_\_\_\_ .
- (VI) Electric ovens using heating elements of ..... can produce temperatures up to 3000°C
- (VII) When a body reflects entire radiation incident on it, then it is known as \_\_\_\_\_ .
- (VIII) In electrode-positive welding \_\_\_\_\_ of the total heat is produced at the electrode.
- (IX) The energy required for refining of gold in kWh / tone is about \_\_\_\_\_
- (X) When 'Skidding' of a vehicle always occurs?
- (XI) Which gas can be filled in GLS lamps?
- (XII) In an electric press mica is used as \_\_\_\_\_ .

## Group-B (Short Answer Type Question)

Answer any three of the following :

[ 5 x 3 = 15 ]

2. Which scheme is generally used for overhead electrification of long distance railway in India? Why? [5]
3. Derive the relation between Luminance and Illuminance of a point light source [5]
4. A suburban train runs with an average speed of 36 km/h between two stations 2 km apart. Values of acceleration and retardation are 1.8 km/h/s and 3.6 km/h/s. Compute the maximum speed of the train assuming trapezoidal speed/time curve. [5]
5. Discuss about the Laws of Illumination and establish them with mathematical analysis. [5]
6. Compare resistance welding and arc welding. [5]

## Group-C (Long Answer Type Question)

Answer any three of the following :

[ 15 x 3 = 45 ]

7. (A) A corridor is lighted by 4 lamps spaced 10 m apart and suspended at a height of 5 m above the centre line of the floor. If each lamp gives 200 C.P. in all directions below the horizontal, find the illumination at the point on the floor mid-way between the second and third lamps. [ 5+10 ]  
(B) Define the following terms:  
(i) Candela  
(ii) Luminous Intensity  
(iii) Coefficient of Reflection  
(iv) Mean spherical candle-power  
(v) Luminous Exitance
8. (A) Discuss about different methods of heat transfer with proper mathematical expression. [ 7+8 ]  
(B) A resistance oven employing nichrome wire is to be operated from 220 V single-phase supply and is to be rated at 16 kW. If the temperature of the element is to be limited to 1,170°C and average temperature of the charge is 500°C, find the diameter and length of the element wire. Radiating efficiency = 0.57, Emissivity=0.9, Specific resistance of nichrome=(109 ×10<sup>-8</sup>) ohm-m.
9. (A) Discuss about the Depreciation Factor (p) of a light source. [ 5+10 ]  
(B) Let us consider that your classroom, 7 m × 10 m × 4 m high is to be illuminated to 135 lm/m<sup>2</sup> on the working plane. If the coefficient of utilization is 0.45 and the sources give 13 lumens per watt, work out the total wattage required, assuming a depreciation factor of 0.8 . Sketch roughly the plan of the room, showing suitable positions for fittings, giving reasons for the positions chosen.

10. (A) Give a brief overview on electric arc furnaces. [ 7+8 ]

(B) If a 3-phase arc furnace is to melt 10 tonne steel in 2 hours, estimate the average input to the furnace if overall efficiency is 50%. If the current input is 9,000 A with the above kW input and the resistance and reactance of furnace leads (including transformer) are 0.003  $\Omega$  and 0.005  $\Omega$  respectively, estimate the arc voltage and total kVA taken from the supply

Specific heat of steel = 444 J kg<sup>-1</sup>°C<sup>-1</sup>

Latent heat of fusion of steel = 37.25 kJ/kg

Melting point of steel = 1,370 °C

11. (A) Discuss about Regenerative Braking with D.C. Motors traction drive [ 8+7 ]

(B) The following figures refer to the speed-current and torque – current characteristics of a 600 V d.c. series traction motor.

Current, amperes :	50	100	150	200	250
Speed, kmph :	73.6	48	41.1	37.3	35.2
Torque, N-m :	150	525	930	1,335	1,750

Determine the braking torque at a speed of 48 kmph when operating as self-excited d.c. generator.

Assume resistance of motor and braking rheostat to be 0.6 $\Omega$  and 3.0  $\Omega$  respectively.

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : PC-EE 402/PC-EEE 402 Digital Electronic

UPID : 004419

Time Allotted : 3 Hours

Full Marks : 70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) What is the difference between digital signal and discrete signal?
- (II) In a DRAM, what is the state of R/W during a read operation?
- (III) A binary-weighted digital-to-analog converter has an input resistor of 100 k  $\Omega$ . If the resistor is connected to a 5 V source, the current through the resistor is:
- (IV) What is the meaning of RAM, and what is its primary role?
- (V) How is an encoder different from a decoder?
- (VI) How you can convert a two-input NAND gate to an inverter?
- (VII) The difference between analog voltage represented by two adjacent digital codes, or the analog step size, is known as \_\_\_\_\_.
- (VIII) A 64-bit word consists of \_\_\_\_\_.
- (IX) Convert the following SOP expression to an equivalent POS expression.  
 $A B C + A \bar{B} \bar{C} + A \bar{B} C + A B \bar{C} + \bar{A} \bar{B} C$
- (X) If two inputs are active on a priority encoder, which will be coded on the output?
- (XI) From the truth table below, determine the standard SOP expression.

Inputs			Output
A	B	C	X
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	1
1	1	1	0

- (XII) What is difference between Frequency Division multiplexing and Wave Division multiplexing?

## Group-B (Short Answer Type Question)

Answer any three of the following :

[ 5 x 3 = 15 ]

2. What is a multiplexer circuit? Briefly describe one or two applications of a multiplexer? [5]
3. What is meant by the race around problem in J-K flip-flops? How does a master–slave configuration help in solving this problem? [5]
4. Design the circuit by following proper steps for the Boolean expressions of the two output variables given in the equations below. [5]
 
$$D = \bar{A}.\bar{B}.B_{in} + \bar{A}.B.\bar{B}_{in} + A.\bar{B}.\bar{B}_{in} + A.B.B_{in}$$

$$B_o = \bar{A}.\bar{B}.B_{in} + \bar{A}.B.\bar{B}_{in} + \bar{A}.B.B_{in} + A.B.B_{in}$$
5. What is a flip-flop? Show the logic implementation of an R-S flip-flop having active HIGH R and S inputs. Draw its truth table and mark the invalid entry. [5]
6. Starting with the Boolean expression for a two-input OR gate, apply Boolean laws and theorems to modify it in such a way as to facilitate the implementation of a two-input OR gate by using two-input NAND gates only. [5]

## Group-C (Long Answer Type Question)

Answer any three of the following :

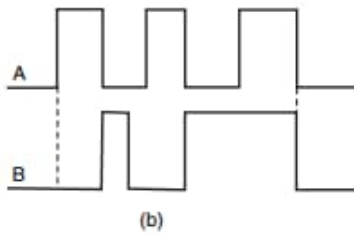
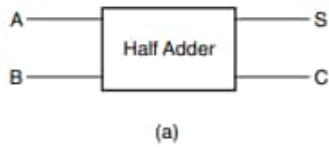
[ 15 x 3 = 45 ]

7. What is meant by the radix or base of a number system? Briefly describe why hex representation is used for the addresses and the contents of the memory locations in the main memory of a computer. Assume a radix-32 arbitrary number system with 0–9 and A–V as its basic digits. Express the mixed binary number  $(110101.001)_2$  in this arbitrary number system. [ 5+10 ]

8. (a) How do you characterize or define a combinational circuit? How does it differ from a sequential circuit? Give two examples each of combinational and sequential logic devices. [ 7 ]

- (b) For the half-adder circuit of following figure, the inputs applied at A and B are as shown in graphical form. [ 8 ]

Plot the corresponding SUM and CARRY outputs on the same scale.



9. (a) How do you distinguish between positive and negative logic systems? Prove that an OR gate in a positive logic system is an AND gate in a negative logic system. [ 7 ]

- (b) Why are NAND and NOR gates called universal gates? Justify your answer with the help of examples. [ 4 ]

- (c) What are logic gates with open collector or open drain outputs? What are the major advantages of such devices? [ 4 ]

10. (a) Implement the product-of-sums Boolean function expressed by  $\Sigma(0,3,4,6,7)$  by a suitable multiplexer. [ 8 ]

- (b) What is a demultiplexer and how does it differ from a decoder? Can a decoder be used as a demultiplexer? If yes, from where do we get the required input line? [ 7 ]

11. (a) A certain eight-bit D/A converter has a full-scale output of 5 mA and a full-scale error of  $\pm 0.25\%$  of full scale. Determine the range of expected analogue output for a digital input of 10000010. [ 8 ]

- (b) The data sheet of a certain eight-bit A/D converter lists the following specifications: resolution eight bits; full-scale error 0.02 % of full scale; full-scale analogue input +5 V. Determine (a) the quantization error (in volts) and (b) the total possible error (in volts). [ 7 ]

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : PC-EE 601/PC-EEE 601 Power System-II

UPID : 006603

Time Allotted : 3 Hours

Full Marks : 70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) What is the expression of fault current in case of LG fault?
- (II) What will be nature of stability if the torque angle  $\delta$  continuously increases?
- (III) What is the purpose of Buchholz relay?
- (IV) What is the difference between per unit impedances of a transformer referred from the primary and secondary side?
- (V) What is the main criterion for selecting the size of a distributor for a radial distribution system?
- (VI) In which bus of the power network, voltage magnitude and angle are unknown?
- (VII) A 100 kVA transformer has a reactance of 6%. What will be value of its reactance at 300 kVA base?
- (VIII) What do you mean by distribution system?
- (IX) For which condition, a voltage-controlled bus is treated as a load bus in subsequent iteration?
- (X) What is the value of positive sequence component of voltage at the point of fault in case of 3-phase fault?
- (XI) A 11 kV, 10 MVA alternator has impedance of 0.10 p.u when referred to its ratings as bases. What will be the new value for base as 110 kV, 20 MVA ?
- (XII) What is the function of feeder in distribution system?

## Group-B (Short Answer Type Question)

Answer any three of the following :

[ 5 x 3 = 15 ]

2. What are the fundamental requirements of protective relaying? Depending upon their (i) construction and principle of operation and (ii) time of operation, how relays are classified? [5]
3. What do you mean by sub-station? Classify the substations. [5]
4. A single phase transformer is rated as 2.5 kVA, 11/0.4 kV. If the leakage reactance is 0.96 ohm when referred to low-voltage side, then determine its leakage reactance in per unit. [5]
5. A 2-wire d.c. ring distributor is 300 m long and is fed at 240 V at point A. At point B, 150m from A, a load of 120 A is taken and at C, 100m in the opposite direction, a load of 80 A is taken. If the resistance per 100m of single conductor is 0.03 Ohm, find [5]
  - (i) current in each section of distributor
  - (ii) voltage at points B and C
6. A generator of negligible resistance having 1.0 per unit voltage behind transient reactance is subjected to different types of faults. [5]

Type of Fault	Resulting fault current in p.u
3-phase	3.33
L-L	2.23
L-G	3.01

Calculate the per unit values of 3 sequence –reactance.

## Group-C (Long Answer Type Question)

Answer any three of the following :

[ 15 x 3 = 45 ]

7. (a) What do you mean by Per Unit (pu) system? [ 2 ]
- (b) What are the advantages of Per Unit (pu) system? [ 5 ]
- (c) An 11/0.4 kV, 200kVA transformer has an equivalent impedance of  $(2.4+j12.4)$  Ohms referred to the hv side. Determine the base values for the p.u. system, the per-unit equivalent impedance and the equivalent impedance drop at one-half rated current. [ 8 ]
8. (a) [ 6 ]

What are the comparisons between overhead distribution system and underground distribution system?

(b) What are the advantages of double end fed distribution system over single end fed distribution system? [ 2 ]

(c) A 2-wire dc distributor cable AB is 2 km long and supplies loads of 100 A, 150A, 200A and 50A situated 500m, 1000m, 1600m and 2000m from the feeding point A. Each conductor has a resistance of 0.01 Ohm/1000m. Calculate the potential difference at each load point if a p.d. of 300V is maintained at point A. [ 7 ]

9. (a) Classify different kind of distribution system along with relevant diagrams. [ 6 ]

(b) A 250m, 2-wire dc distributor fed from one end is loaded uniformly at the rate of 1.6A/metre. The resistance of each conductor is 0.0002 Ohm/metre. Find the voltage necessary at feed point to maintain 250 V (i) at the far end (ii) at the mid point of the distributor. [ 7 ]

(c) What are the advantages of ac system over dc system? [ 2 ]

10. (a) What are the comparisons between Gauss-Seidel method and Newton-Raphson method? [ 5 ]

(b) Why generator bus is called PV bus? [ 2 ]

(c) The following is the system data for a load flow solution: [ 8 ]

The line admittances:

Bus code	Admittance(p.u.)
1-2	2-j8.0
1-3	1-j4.0
2-3	0.666-j2.664
2-4	1-j4.0
3-4	2-j8.0

The schedule of active and reactive powers:

Bus code	P(P.u)	Q(P.u)	V(P.U.)	Remarks
1	-	-	1.06	Slack
2	0.5	0.2	1+j0.0	PQ
3	0.4	0.3	1+j0.0	PQ
4	0.3	0.1	1+j0.0	PQ

If bus 2 is taken as generator bus with voltage magnitude=1.04 p.u and reactive power constraint is  $0.1 \leq Q_2 \leq 1.0$

Determine the voltages starting with a flat voltage profile and assuming accelerating factor as 1.0.

11. (a) Derive sequence voltages in case of solidly earthed L-G fault with the help of symmetrical component method. [ 5 ]

(b) Find out different sequence current components in term of positive sequence current component, fault current and draw the sequence impedance network for L-G fault. [ 5 ]

(c) A 3-phase star connected alternator is rated 30 MVA, 13.8 kV and has following sequence reactance values: [ 5 ]

$X_1=0.25p.u.$ ,  $X_2=0.35p.u.$ ,  $X_0=0.10p.u.$  The neutral of the alternator is solidly grounded. Determine the alternator line currents when a double line-to-ground fault occurs on its terminals. Assume that the alternator is unloaded and is operating at rated voltage when the fault occurs.

\*\*\* END OF PAPER \*\*\*





# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : PE- EE 801C/PE- EEE-801B Advanced Electric Drives

UPID : 008251

Time Allotted : 3 Hours

Full Marks :70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following : [ 1 x 10 = 10 ]
- (I) What devices exhibit linearly rising load torque characteristics?
  - (II) Draw I vs V curve for a power diode with R load.
  - (III) A three-phase, three-pulse, M-3 type controlled converter has firing angle for one of the SCRs set as  $15^\circ$ . This SCR would start conducting at which degree.
  - (IV) The class A commutation or load commutation is possible in case of-----
  - (V) When a diode is connected in series with an AC source & R load, the conduction time per cycle is-----
  - (VI) What are functions of electric drive?
  - (VII) Which of the following type of grounding is used to suppress the capacitive effect?
  - (VIII) Load interrupter operated at \_\_\_\_\_
  - (IX) Calculate the output frequency for the six-pulse converter if the supply frequency is 10 Hz.
  - (X) Which of motor is used in recording instruments?
  - (XI) What are the different types of Stress?
  - (XII) Which starting method is the best method in Induction motor?

## Group-B (Short Answer Type Question)

Answer any three of the following : [ 5 x 3 = 15 ]

2. List the various DSPs available in market and draw the basic block diagram of DSP controller. [5]
3. Draw and explain the block diagram of synchronous motor drive. [5]
4. Explain briefly the control of Current Source Inverter with necessary diagram. [5]
5. Draw and explain the operation of open loop V/f control of Induction motor with PWM voltage fed converter. [5]
6. Explain effective rotor resistance control of an Induction Motor. [5]

## Group-C (Long Answer Type Question)

Answer any three of the following : [ 15 x 3 = 45 ]

7. (a) Draw block diagram of speed control of BLDC motor drive. [ 8 ]  
(b) List different control techniques of PMSM. [ 7 ]
8. (a) Write a note on open-loop v/f control of synchronous motor. [ 8 ]  
(b) Explain the CSI fed synchronous motor drive. [ 7 ]
9. (a) Describe different types of speed control technique of three phase Induction Motor and Explain any of one with suitable diagram. [ 8 ]  
(b) Compare Direct Torque Control and Flux Oriented Control of an Induction Motor drive [ 7 ]
10. (a) Explain dual converter with suitable diagram. [ 8 ]  
(b) Explain Three Level Inverter technique [ 7 ]
11. (a) Explain Clarke's transformation for ABC to  $\alpha\beta$  conversion [ 8 ]  
(b) Explain Park's transformation for  $\alpha\beta$  to dq conversion. [ 7 ]

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : PC-EE 401/PC-EEE 401 Electric machine-I

UPID : 004420

Time Allotted : 3 Hours

Full Marks : 70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) A transformer transforms which parameter of electricity?
- (II) Scott-connections are used for the transformation of \_\_\_\_\_
- (III) Transformer cores are laminated in order to \_\_\_\_\_
- (IV) In a 4-pole, 25 KW, 200V wave wound D.C. shunt generator the current in each parallel path will be \_\_\_\_\_
- (V) The number of parallel paths for a simplex lap winding is equal to \_\_\_\_\_
- (VI) D.C. generator works on the principle of Fleming's \_\_\_\_\_ hand rule.
- (VII) In a transformer, the leakage flux of each winding is proportional to the current in that winding because leakage paths do not saturate. State true or false.
- (VIII) The essential condition for parallel operation of two 1- $\phi$  transformers is that they should have the same \_\_\_\_\_
- (IX) The developed electromagnetic force and/or torque in electro-mechanical energy conversion system act in a direction tends to increase the stored energy at constant flux. Is it true or false?
- (X) In a DC series motor torque is approximately proportional to \_\_\_\_\_
- (XI) What conversion commutator does in dc machines?
- (XII) A delta-zigzag three-phase transformer can be designated as \_\_\_\_\_

## Group-B (Short Answer Type Question)

Answer any three of the following :

[ 5 x 3 = 15 ]

2. Draw and explain the method of speed control of a DC motor by flux control method. Discuss the ranges of speed control by the flux control method. [5]
3. What is commutation? Briefly explain the factors that enable sparkless commutation in a dc machine [5]
4. Explain three point starter with neat diagram. [5]
5. For any DC machine, prove that  $E = P\Phi ZN/60A$  [ all the parameters bear the usual meaning] [5]
6. A 50 kVA, 1000/100 V single phase two-winding transformer is to be connected as an auto-transformer as shown. Find kVA rating of the auto-transformer. [5]

## Group-C (Long Answer Type Question)

Answer any three of the following :

[ 15 x 3 = 45 ]

7. a) Under what condition can a transformer have zero voltage regulation? [ 15 ]  
b) In a given transformer, without changing its constructional features, how can you reduce its eddy current and hysteresis losses?  
c) A 10 kVA, 400/200 V single phase transformer with a percentage resistance of 3% and percentage reactance of 6% is supplying a current of 50 A to a resistive load. Find the value of the load voltage.
8. Write short notes in i) armature reaction (ii) back-emf (iii) Commutation in DC machines [ 15 ]
9. a) What do you mean by neutral shifting of a 3-phase transformer? [ 15 ]  
b) Explain the use of tertiary winding in a star-star transformer.  
c) One of the windings of a 3phase transformer shall be delta connected. Explain why.
10. a) State the essential and desirable conditions to be fulfilled for successful parallel operation of transformers. [ 15 ]  
b) A transformer is working under rated condition on a 200 V, 50 Hz supply. Find the percentage change in hysteresis and eddy current losses when the same transformer is operated on a 160 V, 40 Hz supply.  
c) The primary of a transformer is rated at 10A and 1000V.  
On open-circuit the readings are:  $V_1=1000V$ ,  $V_2 =500V$ .  $I=0.42$  A and  $P_{oc} =100W$ .

On short circuit the readings are  $I_1=10A$ ,  $V_1=126V$  and  $P_{sc}=400W$ .

Draw the equivalent circuit for the transformer and determine the parameters.

11. a) Three single phase transformers are connected in delta. If one of the transformers is found faulty and removed, Derive the reduction in kVA supplied. [ 15 ]
- b) Two single-phase transformers A and B have the following parameters:  
Transformer A: 5 kVA , 400V/200V, percentage resistance and percentage reactance 3% and 4% respectively.  
Transformer B: 5 kVA, 400V/200V, percentage resistance and percentage reactance 4% and 3% respectively.

These two transformers are connected in parallel and they share a common load of 12 kW at a power factor of 0.8 lagging. Determine the (i) active power delivered by transformer A and (ii) reactive power delivered by transformer A.

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : PE-EE 601A Digital control system

UPID : 006642

Time Allotted : 3 Hours

Full Marks : 70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) Anti-aliasing filter is \_\_\_\_\_.
- (II) The ROC of a causal signal is \_\_\_\_\_ of a circle of radius R.
- (III) Jordon canonical form state model is applicable to \_\_\_\_\_.
- (IV) A linear discrete time has characteristic equation  $Z^3 - 0.16Z = 0$ . Check the stability.
- (V) Assertion (A): z-transform is used to analyze discrete time system and it is also called pulse transfer function approach. Reason (R): the sampled signal is assumed to be impulse trained whose strength or areas are equal to the continuous time signal of the sampling instants.  
Which of statement is /are correct

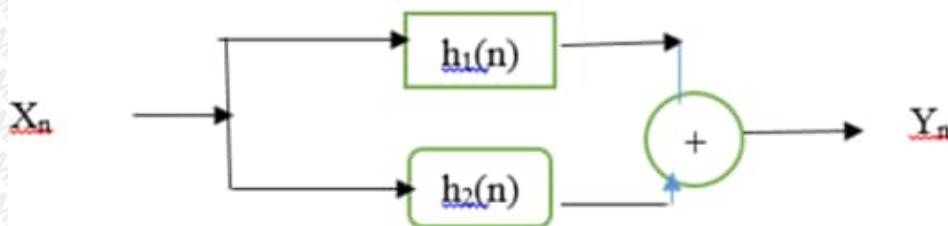
1. Both A & R true. R is the correct explanation of A
2. Both A & R true. R is not the correct explanation of A
3. A is true and R is false
4. A & R both are false

- (VI) Jury stability is used for \_\_\_\_\_.
- (VII) Given a unit step function  $U(k)$ , it is time derivative of \_\_\_\_\_.
- (VIII) A state space system is described by

$$F = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix}$$

Characteristic equation of the system is \_\_\_\_\_.

- (IX) If a system has one or more non repeated roots on the unit circle, the system is \_\_\_\_\_ stable.
- (X) Find the mathematical expression of given system



- (XI) Find the Z transform corresponding to the Laplace transform

$$G(s) = \frac{10}{s(s+5)}$$

- (XII) Find  $Y(z)/X(z)$  for the system described by the difference equation  $Y(n) = Y(n-1) + X(n)$ .

## Group-B (Short Answer Type Question)

Answer any three of the following :

[ 5 x 3 = 15 ]

2. State initial and final value theorem of Z transform with mathematical expression. [5]
3. Write short note on folding. [5]
4. Determine Z transformation of polynomial function  $a^k u(k)$  with ROC. [5]
5. Consider the function [5]

$$X(S) = \frac{1 - e^{-ST}}{S}$$

Show that  $s=0$  is not a pole of  $X(S)$ .

6. Define state transition matrix and write the properties of state transition matrix. [5]

**Group-C (Long Answer Type Question)**

Answer any three of the following : [ 15 x 3 = 45 ]

7. (a) Write the differences between digital control and continuous control system. [ 5 ]  
 (b) Write short note on A/D converter [ 5 ]  
 (c) Write short note on sample and hold circuit. [ 5 ]

8. (a) Find  $X(k)$  for  $k=0,1,2,3,4, \dots$  when  $X(Z) = \frac{(10z+5)}{(z-1)(z-0.2)}$  [ 5 ]

- (b) Given Z transform [ 5 ]

$$X(z) = \frac{(1 - e^{-aT})z}{(z-1)(z - e^{-aT})}$$

find inverse z transform using partial fraction method.

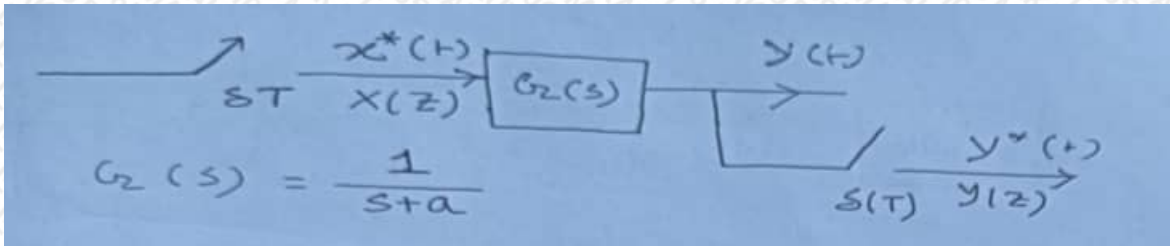
- (c) Solve the following difference equation by use of z transformation method [ 5 ]

$$x(k+2) + 3x(k+1) + 2x(k) = 0; x(0) = 0, x(1) = 1,$$

r 3

9. (a) Write short notes on Aliasing [ 5 ]

- (b) Obtain the pulse transfer function  $G(z)$  of the system shown in figure [ 5 ]



- (c) Obtain the pulse transfer function of a digital PID controller. [ 5 ]

10. (a) Write necessary and sufficient condition for the state observer design. [ 5 ]

- (b) Write short note on full order state observer [ 5 ]

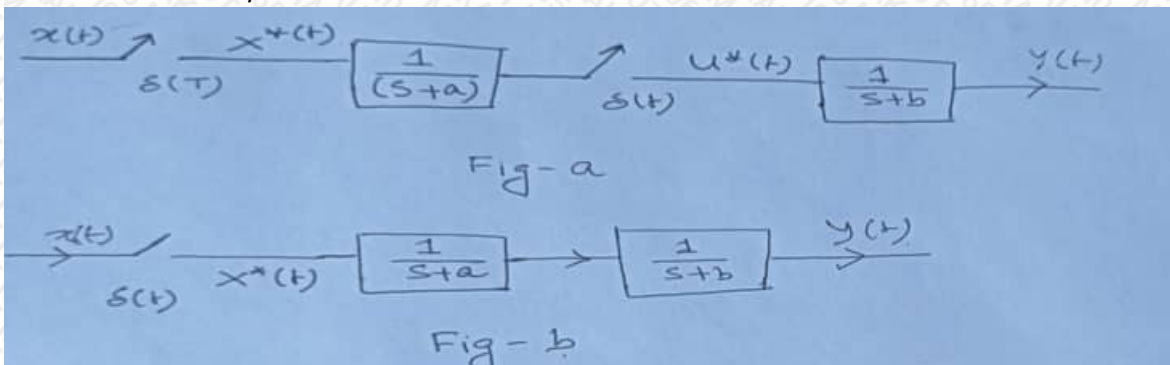
- (c) Why the state observers are used in control system? [ 5 ]

11. (a) Define sampling theorem. Write significance of sampling theorem in digital control study. [ 5 ]

- (b) Consider the system shown in figure a and b. Obtain the pulse transfer function [ 10 ]

$$\frac{Y(Z)}{X(Z)}$$

for the each of two system.





# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : PE-EE 602C/PE-EEE 602C Industrial Electrical Systems

UPID : 006619

Time Allotted : 3 Hours

Full Marks :70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) The direction of induced EMF in an electric generator can be find out by using which rule ?
- (II) Write the colour codes of AC power circuit for single phase circuit.
- (III) Which is the motor used in fan?
- (IV) What are the uses of Servomotors?
- (V) Open wiring is also known as \_\_\_\_\_ wiring.
- (VI) In an electric circuit, the positive side is connected to the \_\_\_\_\_, and the switch is used to start the power supply.
- (VII) While working with electricity, the technician must wear \_\_\_\_\_ gloves and shoes.
- (VIII) What is Cogging ?
- (IX) How many types of DC Generators?
- (X) Why is PVC casing-capping preferred over wooden casing-capping wiring?
- (XI) Why Silver is a good conductor of electricity, but it is rarely used as a wiring material ?
- (XII) What is static electricity?

## Group-B (Short Answer Type Question)

Answer any three of the following :

[ 5 x 3 = 15 ]

2. Enlist any two advantages and two disadvantages of group drives. [5]
3. State any two applications of each for the Dielectric heating. [5]
4. Define the following terms related to illumination systems Depreciation factor. [5]
5. Describe the concept of following load cycle with their graphical representation on Long time (intermittent) loading. [5]
6. State the types of enclosures to be used for electric drives in following industrial locations on Mines or other hazardous location. [5]

## Group-C (Long Answer Type Question)

Answer any three of the following :

[ 15 x 3 = 45 ]

7. a. Explain the different welding process under resistance welding. [ 7+8 ]  
b. Why electric heating is preferred over other forms of heating? Explain the principle of operation of dielectric heating. What are the applications of dielectric heating?
8. a. Explain selection and sizing of components in wiring system. [ 7+8 ]  
b. How do you measure earth wire? Explain in detail.
9. a. What are different classifications of loads? Explain in detail. [ 6+9 ]  
b. An electric train has an average speed of 40km ph on a level track between stops 2.2 Km apart. It is accelerated at 2.1Kmphps and braked at 2.9 Kmphps . Draw the speed time curve for the run Estimate the energy consumption at the train per tonne -Km. Take tractive resistance constant at 40 Nw per tonne and allow 8% for rotational inertia.
10. a. Describe with neat labeled diagram the working principle of Ajax Wyatt furnace. State its drawbacks. [ 6+9 ]  
b. The trapezoidal time curve of train consists of: (i) Uniform acceleration of 6kmphps for 25 seconds. (ii) Free running for 10 minutes (iii) Uniform deceleration of 6kmphps to stop the train (iv) A stop time of 5 minutes.  
Find the distance between the stations, average and scheduled speed.
11. a. What are the ways and means of avoiding weld defects? [ 6+9 ]  
b. An industrial consumer having maximum demand of 100 kW maintains a load factor of

60%. The tariff rates are Rs. 1000/- per kVA of maximum demand per annum plus Rs.5/- per kWh of energy consumed. If the average power factor is 0.8 lagging. Calculate the total energy consumed per annum and annual electricity bill.

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : OE-601A/OE-EE601A Digital Signal Processing

UPID : 006623

Time Allotted : 3 Hours

Full Marks : 70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) Autocorrelation function of periodic signal is equal to \_\_\_\_\_ of the signal.
- (II) The function given by the equation  $x(n)=1$ , for  $n=0$ ;  $x(n)=0$ , for  $n \neq 0$  is called ----- function.
- (III) Write down the differentiation property of z transform
- (IV) The Fourier transform of  $x(n)=(0.8)^n$  is -----, where  $n=0,1,2,3..$
- (V) Infinite memory system is also known as ----- system.
- (VI) Power spectrum describes distribution of \_\_\_\_\_ under frequency domain.
- (VII) The filter that may not be realized by approximation of derivatives techniques are called -----
- (VIII) Explain the non-parametric methods of power spectrum estimation.
- (IX) Show whether the function is periodic or not

$$x(t) = \cos\left(\frac{2}{5}\pi t\right) + \cos\left(\frac{2}{7}\pi t\right)$$

- (X) Z and Laplace transform are related by.....
- (XI) By applying time shifting property determine the z transform of the

$$x(z) = \frac{z^{-1}}{1 - 3z^{-1}}$$

- (XII) Write the formula of IDFT.

## Group-B (Short Answer Type Question)

Answer any three of the following :

[ 5 x 3 = 15 ]

2. Write down the energy and power equation in continuous and discrete domain. [5]
3. Find the inverse z transform of [5]

$$G(z) = \frac{0.78z}{(z - 0.60)(z - 1)}$$

4. Explain the power spectrum estimation using AR model. [5]
5. Consider the following two LTI systems:  $H_1(z) = 1 + 0.5z^{-1} + 0.25z^{-2}$   $H_2(z) = 1 - 0.9z^{-1} + 0.81z^{-2}$  Determine the impulse response of the system  $H(z) = H_1(z) * H_2(z)$  using convolution in time domain. [5]
6. A lowpass Butterworth filter is designed with a passband edge frequency of 2 kHz and a stopband edge frequency of 2.5 kHz. The sampling rate is 8 kHz, and the passband and stopband ripple are both 0.1 dB. Determine the filter order and the filter coefficients. [5]

## Group-C (Long Answer Type Question)

Answer any three of the following :

[ 15 x 3 = 45 ]

7. a) Compute the autocorrelation and power spectral density for the signal  $x(t)=K\cos(2\pi f_c t + \phi)$  [ 7+8 ]  
Where K and  $f_c$  are constant and  $\phi$  is a random variable which is uniformly distributed over the interval  $(-\pi, \pi)$   
b) Determine the estimation of the autocorrelation and power spectrum of random signals.
8. a) Explain the following methods of IIR filter design [ 7+4+4 ]  
impulse invariant method  
approximation of derivative methods



b) use the backward difference for the derivative and convert the analog filter with system function

$$H(s) = 1/(s^2 + 16)$$

c) For the analog transfer function

$$H(s) = 1/(s+1)(s+2)$$

Determine  $H(z)$  using impulse invariant method

9. a) Compute the signal energy and power for the system given below [ 6+3+6 ]

i)  $x(t) = e^{-4t} u(t)$

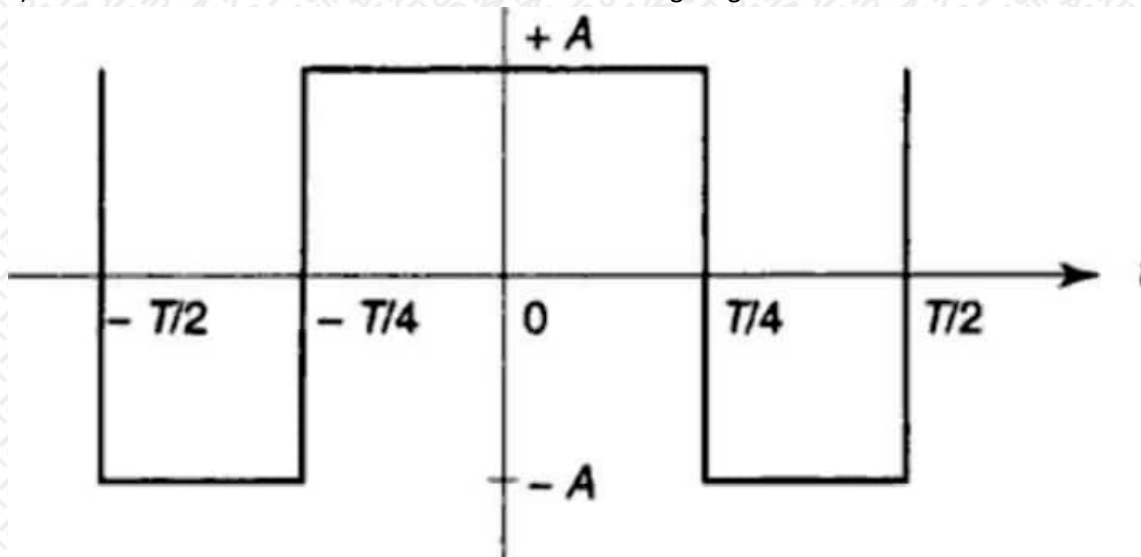
$u(t) = 1$  for  $t \geq 0$

$u(t) = 0$  for  $t < 0$

ii)  $x(t) = e^{-3|t|}$

b) Define unit pulse function and write down its mathematical formula

c) Find the Fourier coefficient and Fourier series of the signal given below



10. a) Explain the Decimation of Time (DIT) algorithms of FFT [ 8+7 ]

b) With help of DIT FFT method find the DFT of the sequence given below

$$x(n) = \{1, 2, 3, 4, 4, 3, 2, 1\}$$

11. a) Explain the different methods of calculation of inverse z transform. [ 4+8+3 ]

b) Find the inverse z transform of the function given below

i) Use long division method

$$F(z) = \frac{z + 1}{z^2 + 0.2z + 0.1}$$

ii) Use partial fraction method

$$F(z) = \frac{z + 1}{z^2 + 0.3z + 0.02}$$

c) Determine the relationship between z transform and DFT

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : PE-EC505C Power Electronics

Time Allotted : 3 Hours

Full Marks :70

*The Figures in the margin indicate full marks.*

*Candidate are required to give their answers in their own words as far as practicable*

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) What is the duty cycle of a chopper?
- (II) In a constant current source inverter (i) a capacitor is connected in series with a voltage source (ii) an inductor is connected in series with a voltage source (iii) a capacitor is connected in parallel with a voltage source (iv) an inductor is connected in parallel with a voltage source.
- (III) The applications of a AC/AC type converters are found in Wind turbines  
True or false
- (IV) Which of the following terminals does not belong to the MOSFET?  
Base, Drain, Gate, Source
- (V) A freewheeling diode across inductive load will provide  
quick turn-on, slow turn-off, reduced utilization factor, improved power factor
- (VI) A chopper can be used on both PWM and FM. True or false
- (VII) Commutating overlap in the phase controlled ac to dc converters is due to \_\_\_\_\_
- (VIII) In dc choppers, per unit ripple is maximum when duty cycle is \_\_\_\_\_?
- (IX) PWM is used in inverters to control output voltage.  
True or false
- (X) SMPS are based on the Chopper principle.  
True or false
- (XI) Why Snubber circuits are used with thyristors ?
- (XII) A six-pulse thyristor bridge rectifier is connected to a balanced three phase, AC source. Assuming that the DC output current of the rectifier is constant, the lowest harmonic component in the AC input current is \_\_\_\_\_

## Group-B (Short Answer Type Question)

Answer any three of the following

[ 5 x 3 = 15 ]

2. Why IGBT is very popular nowadays? [ 5 ]
3. With suitable waveforms explain the operation of a 1- $\phi$  full controlled rectifier with R-L load. What is the purpose of free-wheeling diode? [ 5 ]
4. What are the advantages of GTO over SCR? [ 5 ]
5. Discuss the effect of 'LS', the ac-side inductance, on the performance of a 1- $\phi$  full bridge controlled rectifier. [ 5 ]
6. Write the comparison between SMPS and Linear Power Supply? [ 5 ]

## Group-C (Long Answer Type Question)

Answer any three of the following

[ 15 x 3 = 45 ]

7. (a) Explain the power diode characteristics and classify power diodes. [ 10 ]  
(b) Why are SCRs connected in series or in parallel. [ 5 ]
8. (a) What is the condition of inverter mode of operation of a full controlled converter. Explain with circuit diagram and relevant waveforms. [ 10 ]  
(b) What are the advantages of single-phase bridge converter over single phase mid-point converter? [ 5 ]
9. (a) Describe the working of a single-phase half-controlled converter with RLE load with the waveforms. What is the purpose of addition of a free-wheeling diode in the circuit. [ 8 ]

- (b) A single phase 230V, 1 KW heater is connected across 1 phase 230V, 50Hz supply through an SCR. For firing angle delay of 45° and 90°, calculate the power absorbed in the heater element. [ 7 ]
10. (a) Show that for a basic dc-dc converter, the critical inductance of the circuit is given by  $L_c = \frac{V_0}{2fI_0}$ ; where  $V_0$ ,  $V_S$ ,  $P_0$  and  $f$  are the load voltage, source voltage, load power and chopping frequency respectively. [ 8 ]
- (b) A type-A chopper has input dc voltage of 200V and a load of  $R=10\Omega$  in series with  $L=80\text{mH}$ . If load current varies linearly between 12A and 16A, find the time ratio  $T_{on}/T_{off}$  for this chopper [ 7 ]
11. (a) What is an IGBT? Give its basic structural features. How does it differ in structure from PMOSFET? [ 10 ]
- (b) Compare power MOSFETs with BJTs. [ 5 ]

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : OE-EC704A Web Technology

Time Allotted : 3 Hours

Full Marks :70

*The Figures in the margin indicate full marks.*

*Candidate are required to give their answers in their own words as far as practicable*

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) What is an applet?
- (II) Name one tag which does not require any terminator.
- (III) Which class in Java is superclass of every other class?
- (IV) What is an interface?
- (V) What is a I/O stream?
- (VI) What is a remote applet?
- (VII) What is serialization?
- (VIII) Which function is called to display the output of an applet?
- (IX) What will be the output ofThe following statements?

```
System.out.println("Hi there");
System.out.println("This is My Exam");
```

- (X) What is order of calling constructors in case of inheritance?
- (XI) What are the tasks of JVM?
- (XII) Can we access both superclass and subclass members if we create an object of subclass?

## Group-B (Short Answer Type Question)

Answer any three of the following

[ 5 x 3 = 15 ]

2. Distinguish between the terms: Inheritance and Polymorphism. [ 5 ]
3. Describe different forms of inheritance with examples. [ 5 ]
4. What is final keyword in Java? Give an example. [ 5 ]
5. Describe various forms of implementing interfaces. [ 5 ]
6. Write a program to show how user-defined parameters can be supplied to an applet using <PARAM...> tags. [ 5 ]

## Group-C (Long Answer Type Question)

Answer any three of the following

[ 15 x 3 = 45 ]

7. (a) What are the three parts of a simple, empty class? [ 3 ]
  - (b) What is inheritance and how does it help us create new classes quickly? [ 6 ]
  - (c) Compare and contrast overloading and overriding methods. [ 6 ]
8. (a) What is the difference between Exception and Error? Show with an example. [ 5 ]
  - (b) What is the difference between throw and throws? [ 4 ]
  - (c) Write program to handle different types of exception using multiple catch statement. [ 6 ]
9. (a) Explain the concept of Dynamic Binding. [ 5 ]
  - (b) What is initialization? Why is it important? [ 5 ]
  - (c) Write a Java program to convert the given temperature in Fahrenheit to Celsius using the following conversion formula  $C=(F-32)/9$ . [ 5 ]
10. (a) What is class? How does it accomplish data hiding? How do we declare a member of a class static? [ 7 ]
  - (b) How is method defined? [ 3 ]

- (c) Explain method overriding with example. [ 5 ]
11. (a) List a few areas of application of OOP technology. [ 5 ]
- (b) List the basic data types used in Java. Give examples. [ 5 ]
- (c) Write a Java program to determine the sum of the following harmonic series for a given value of n: [ 5 ]  
 $1 + \frac{1}{2} + \frac{1}{3} + \dots + \frac{1}{n}$ .

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : EC504 Digital Signal Processing

Time Allotted : 3 Hours

Full Marks :70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following : [ 1 x 10 = 10 ]
- (I) What is zero padding?
  - (II) If  $X(z)$  is the z-transform of the signal  $x(n)$  then what is the z-transform of  $a^n x(n)$ ?
  - (III) What is the ROC of the signal  $x(n)=\delta(n-k)$ ,  $k>0$ ?
  - (IV) A real valued signal  $x(n)$  is called as anti-symmetric if \_\_\_\_\_
  - (V) What do you mean by the ROC of Z-Transform?
  - (VI) What is impulse train ?
  - (VII) What do you mean by Transfer function as well as impulse response of a system?
  - (VIII) If  $F_s$  is the minimum sampling rate and  $F_{max}$  is the highest frequency available in the analog signal, then the Nyquist rate?
  - (IX) Write down the demerits of FIR Filter.
  - (X) What is meant by radix 2 FFT?
  - (XI) Find the linear convolution between  $x(n)=[1 \ 2 \ 3 \ 4]$  and  $h(n)=[1 \ 1 \ 1]$
  - (XII) Find the Z-transform of  $\cos \omega n u(n)$ .

## Group-B (Short Answer Type Question)

Answer any three of the following

[ 5 x 3 = 15 ]

2. Find the inverse Z – transform for the following function [ 5 ]  
 $X(z) = (z^2 + z)/(z - 1)(z - 3)$
3. State and prove the Parseval's theorem of DTFT. [ 5 ]
4. Check whether the following signal is Energy or Power signal [ 5 ]  
 $e^{j(\pi n/2 + \pi/4)}$   
 $\pi$
5. Write down the relation between Fourier Transform and Z-Transform. [ 5 ]
6. Realize the system given by difference equation [ 5 ]  
 $y(n) = -0.1y(n-1) + 0.72y(n-2) + 0.7x(n) - 0.252x(n-1)$  in parallel form.

## Group-C (Long Answer Type Question)

Answer any three of the following

[ 15 x 3 = 45 ]

7. What do you mean by ROC of Z-Transform? Write down the properties of ROC of z-Transform. [ 2+3 ]  
 Write the convolution property of z-Transform. Using the convolution property of z-Transform find the linear convolution between  $x(n)=[1 \ 2 \ 4 \ 3]$  and  $h(n)=[1 \ 2 \ 1]$  [ 3+3 ]  
 (c) Find the z-Transform and ROC of the signal [ 4 ]  
 $x(n) = -b^n u(-n-1)$
8. Explain how to convert DFT from DTFT. Find DTFT for the following function [ 3+4 ]  
 $x(n) = u(n)$   
 Write down the two properties of Twiddle Factor. Compute DFT of a sequence [ 3+5 ]  
 $x(n) = (-1)^n$  for  $N=4$
9. (a) Write down the different types of signal representation with example. [ 5 ]  
 (b) Write down the difference between Deterministic and Random signal with example. [ 4 ]

- (c) Determine the response of the relaxed system characterized by the impulse response  $h(n)=(1/2)^n u(n)$  to the input signal  $x(n)=2^n u(n)$ . [ 6 ]
10. What do you mean by Transfer Function of a system? A causal system is described by the difference equation  $y(n) = y(n-1) + y(n-2) + x(n-1)$  [ 2+7 ]  
Find the transfer function as well as its impulse response.
- (b) Using the residue method find the inverse z-Transform of  $X(z)=(1-1/4z^{-1})/(1-1/9z^{-2})$  ROC  $|Z|>1/3$  [ 6 ]
11. Write down the differences between IIR and FIR filter. Design a digital Butterworth Filter satisfying the condition [ 3+7 ]  
 $0.707 \leq H(e^{jw}) \leq 1$ , for  $0 \leq w \leq \pi/2$   
 $\leq 0.2$ , for  $3\pi/4 \leq w \leq \pi$   
 With  $T= 1$ sec using Bilinear Transformation Method.
- (b) Design an analog Butterworth Filter that has a -2dB passband attenuation at a frequency of 20rad/sec and [ 5 ]  
at least -10dB stopband attenuation at 30rad/sec

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : PE-EC703B Wireless Sensor Networks

Time Allotted : 3 Hours

Full Marks :70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following : [ 1 x 10 = 10 ]
- (I) \_\_\_\_\_ frequency based wireless communication does not require line of sight between sender and receiver.
  - (II) TinyOS falls under the \_\_\_\_\_ architecture class.
  - (III) What is motes?
  - (IV) Mention the full form of 'MANET'
  - (V) Write down the full form of "IGRP".
  - (VI) Justify the term data flooding
  - (VII) What is sensor network?
  - (VIII) WSN operates at two levels, that's are \_\_\_\_\_
  - (IX) The IEEE 802.15.4 protocol is very much associated with the \_\_\_\_\_ protocol
  - (X) A data fusion node collects the results from \_\_\_\_\_
  - (XI) Why the sink node uses multi-hop path?
  - (XII) In a MANET, network topology may be changed dynamically in an unpredictable manner. Analyze the statement.

## Group-B (Short Answer Type Question)

Answer any three of the following

[ 5 x 3 = 15 ]

2. What are the differences between failed nodes and badly failed nodes? [ 5 ]
3. What is the function of a micro controller in the sensor node? [ 5 ]
4. With the help of a proper block diagram, mention the different components of a sensor node. [ 5 ]
5. Write down the differences between Homogeneous & Heterogeneous WSN? [ 5 ]
6. Summarized the general characteristics of Zigbee protocols. [ 5 ]

## Group-C (Long Answer Type Question)

Answer any three of the following

[ 15 x 3 = 45 ]

7. What do you mean by MANET? [ 5+10 ]  
Write down the different characteristics of MANET.
8. (a) Commenting on the MAC protocol manages the communication traffic on a shared medium with help of the communication protocol stack. [ 5 ]  
(b) Expressing the idea of network typologies of Zigbee protocols. [ 10 ]
9. a) What is meant by scalability in wireless sensor network? [ 5+5+5 ]  
b) Why are ad-hoc networks needed?  
c) What are the different applications of MANET?
10. (a) Compare two different MAC protocols, S-MAC and B-MAC. [ 5 ]  
(b) Classify and compare the scheduling based MAC protocols. [ 10 ]
11. (a) Express the process of software implementation in a gateway network. [ 10 ]  
(b) Write down about the Gateway GPRS Support Node (GGSN). [ 5 ]

\*\*\* END OF PAPER \*\*\*





# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : EC503 Digital Communication & Stochastic Process

Time Allotted : 3 Hours

Full Marks :70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following : [ 1 x 10 = 10 ]
- (I) Minimum shift keying is similar to which modulation scheme?
  - (II) The correlation detector is also known as \_\_\_\_\_
  - (III) If the time taken to randomly select student to complete an exam is considered as a random variable, then which type of random variable is it?
  - (IV) Digital communication is \_\_\_\_\_ to environmental changes?
  - (V) Delta modulation uses \_\_\_\_\_ bits per sample.
  - (VI) The data rate of QPSK is \_\_\_\_\_ of BPSK
  - (VII) The maximum rate of information from transmitter to receiver is known as \_\_\_\_\_
  - (VIII) What is the standard value of A in A-law ?
  - (IX) A M-PSK modulation scheme is used to transmit independent binary digits over a band-pass channel with bandwidth 100 KHz. If the bit rate is 200 kbps the value of M is \_\_\_\_\_
  - (X) Transmitted signal values in each dimension represent the \_\_\_\_\_
  - (XI) Which line coding technique has the maximum synchronizing capability?
  - (XII) For a data stream of [1,0,1,1,0,1], find the phase sequence for BPSK.

## Group-B (Short Answer Type Question)

Answer any three of the following

[ 5 x 3 = 15 ]

2. Describe the process of Natural sampling. What is its disadvantage? [ 5 ]
3. Explain the process of generating FSK signals. [ 5 ]
4. Consider a random process  $X(t)$  given by  $X(t) = A \cos(\omega t + \theta)$ , where  $\omega$  and  $\theta$  are constants and A is a random variable. Determine whether  $X(t)$  is WSS. [ 5 ]
5. Derive an expression for mean-square value of quantization error for PCM system. [ 5 ]
6. Analyze the transmitter, receiver and signal space diagram of Quadrature Amplitude Modulation. [ 5 ]

## Group-C (Long Answer Type Question)

Answer any three of the following

[ 15 x 3 = 45 ]

7. (a) What is QPSK Signal? Explain the generation of QPSK Signal with proper expressions and block diagrams. Draw the constellation diagram for QPSK signal. [ 2+5+2 ]
- (b) In a PAM scheme with  $M = 16$ : [ 6 ]
  - (a) Determine the minimum transmission bandwidth required to transmit data at a rate of 12,000 bits/sec with zero ISL
  - (b) Determine the transmission bandwidth if Nyquist criterion pulses with a roll-off factor  $r = 0.2$  are used to transmit data.
8. (a) Is it true that sampling frequency for a bandpass signal need not be more than double the maximum frequency present in the signal? Explain in light of PAM signal and its spectrum. [ 7 ]
- (b) A band-limited signal  $m(t)$  of 3 kHz bandwidth is sampled at rate of  $33\frac{1}{3}\%$  higher than the Nyquist rate. The maximum allowable error in the sample amplitude (i.e., the maximum quantization error) is 0.5% of the peak amplitude  $m_p$ . Assume binary encoding. Find the minimum bandwidth of the channel to transmit the encoded binary signal. [ 8 ]
9. (a) Describe the operation of Zero forcing equalizer for removal of ISI. [ 7 ]

- (b) What is controlled ISI? Describe the generation of Duo-binary signal. [ 3+5 ]
10. (a) What is ISI? Describe 1<sup>st</sup> Nyquist criteria for removal of ISI. How Cosine roll-off can reduce ISI? [ 2+4+4 ]
- (b) A communication channel of bandwidth 75 kHz is required to transmit binary data at a rate of 0.1 Mb/s using raised-cosine pulses. Determine the roll-off factor  $\alpha$ . [ 5 ]
11. (a) Describe the uniform quantization in PCM system. What are the disadvantages of uniform quantization? How it is overcome? [ 3+2+2 ]
- (b) A compact disc (CD) recording system samples each of two stereo signals with a 16-bit analog-to-digital converter (ADC) at 44.1 kb/s. [ 8 ]
- (a) Determine the output signal-to-quantizing-noise ratio for a full-scale sinusoid.
- (b) The bit stream of digitized data is augmented by the addition of error-correcting bits, clock extraction bits, and display and control bit fields. These additional bits represent 100 percent overhead. Determine the output bit rate of the CD recording system.
- (c) The CD can record an hour's worth of music. Determine the number of bits recorded on a CD.
- (d) For a comparison, a high-grade collegiate dictionary may contain 1500 pages, 2 columns per page, 100 lines per column, 8 words per line, 6 letters per word, and 7 bits per letter on average. Determine the number of bits required to describe the dictionary, and estimate the number of comparable books that can be stored on a CD.

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : EC502 Computer Architecture

Time Allotted : 3 Hours

Full Marks :70

*The Figures in the margin indicate full marks.*

*Candidate are required to give their answers in their own words as far as practicable*

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) What is the Basic difference between vector and array processors?
- (II) What is the difference in the address and data connection between DRAM's and SDRAM's ?
- (III) What are the major components of a CPU in the context of computer architecture ?
- (IV) Mention which signal does the function of execution and sequencing operation ?
- (V) The address in the main memory is known as-
- (VI) How many number of transistor in a CMOS static RAM cell contains?
- (VII) What is Associative memory ?
- (VIII) What is true for a typical RISC architecture?
- (IX) To reduce the memory access time we generally make use of \_\_\_\_\_
- (X) Program counter is-
- (XI) In a microprocessor the address of the next instruction to be executed is stored from
- (XII) Which is a group of bits that tells the computer to perform a particular operation?

## Group-B (Short Answer Type Question)

*Answer any three of the following*

[ 5 x 3 = 15 ]

2. What is a Instruction Code and operation code ? Explain with example. [ 5 ]
3. Describe in brief the micro-programming and micro-programmed control unit. [ 5 ]
4. What do you mean by Multiprocessing and Multi computing? [ 5 ]
5. State the principle of operation of a carry look-ahead adder. [ 5 ]
6. What is the mapping procedures adopted in the organization of a Cache Memory? Define a Hit and Miss? [ 5 ]

## Group-C (Long Answer Type Question)

*Answer any three of the following*

[ 15 x 3 = 45 ]

7. (a) Mention and explain the various phase in executing an instruction. [ 5 ]
- (b) Explain with an example about the operations and operands of the computer hardware. [ 5 ]
- (c) Describe the different types of instructions set architecture with an example ? [ 5 ]
8. (a) Describe the Booth's algorithm for the following multiplication operation ? multiply ( - 9 ) and ( - 3 ). [ 10 ]
- (b) Explain any three addressing modes with example [ 5 ]
9. (a) What are the various ways of representing negative numbers? Explain with example. [ 5 ]
- (b) Compare between Fixed point and Floating point representation of a given number. [ 5 ]
- (c) Compute the arithmetic operation in binary using 2's complement representation (i). (+42) + (-13) (ii) (-42) - (-13). [ 5 ]
10. (a) What is instruction pipelining? [ 3 ]
- (b) What are the conflicts that occurred during instruction Pipelining? [ 5 ]
- (c) Describe the necessity of inter process synchronization ? [ 7 ]
11. (a) Describe the data and control path techniques in pipelining ? [ 7 ]
- (b) Why inter process synchronization is needed? Explain [ 8 ]

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : PE-EC702B Digital Image and Video Processing

Time Allotted : 3 Hours

Full Marks :70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) For what purpose Wiener filter is used?
- (II) Representation & description almost always follow the output of which block of the image processing system?
- (III) Colour image is represented by how many bit?
- (IV) How many video frames the surveillance camera captures per second of video?
- (V) The image  $f(x,y)$  is transformed to  $g(u,v)$  using a image transformation with the following forward kernel

$$1/N = \prod (-1)^{[b(x)b_{n-1-u}(x)+b(y)b_{n-1-u}(y)]}$$

Name the image transformation technique

- (VI) FWT stands for what?
- (VII) What is the intensity level in 8 bit image
- (VIII) Why do we use histogram technique?
- (IX) Name one useful descriptor of a boundary, whose value is given by the ratio of length of the major axis to the minor axis?
- (X) Accuracy of the chain code depends on which factor?
- (XI) Mask of which operator is given by the following  $3 \times 3$  matrix?

-1	-2	-1
0	0	0
1	2	1

- (XII) What will be the 8 directional chain code representation of a square starting from the left top position?

## Group-B (Short Answer Type Question)

Answer any three of the following

[ 5 x 3 = 15 ]

2. Explain why the discrete histogram equalization technique will not in general yield a flat histogram [ 5 ]
3. Find second order derivatives of the given image strip 5 5 3 2 0 0 6 0 8 10 [ 5 ]
4. Compare Rod cell and Cone cell [ 5 ]
5. Find the DC component of the following image. Suggest one way of generating colour histogram in RGB frame. What will be the number of histogram components in this case? [ 5 ]

1	3	6
8	2	4
11	3	7

6. a) Explain the operation of any single image sensor [ 5 ]
- b) A medical Image has a size of 8x8 inches. The sampling resolution is 5 cycles/mm. How many pixels are required? Will an image of size 256x256 be enough?

## Group-C (Long Answer Type Question)

Answer any three of the following

[ 15 x 3 = 45 ]

7. a) Differentiate between image and scene [5+5+5]  
 b) Explain one method of image acquisition  
 c) Explain the term i. connectivity, ii. path, iii. Adjacency in context of image
8. a) Explain the operation of median filtering [5+5+5]  
 b) Compare the basic frequency domain filters  
 i) Ideal low pass  
 ii) Butterworth low pass  
 iii) Gaussian low pass  
 c) Explain the homomorphic filter.
9. a) Brightness discrimination is poor at low levels of illumination. Explain [6+6+3]  
 b) Explain the operation of any array sensor and strip image sensor  
 c) Assume that a 10 m high structure is observed from a distance of 50 m. what is the size of the retinal image?
10. a) Explain the difference between lossy and lossless compression. [2+5+8]  
 b) Explain the following noise  
 i. Salt & Pepper noise  
 ii. Gaussian noise  
 c) Perform histogram stretching for the image distributions shown in the following table so that new image has dynamic range of [0,7].

Gray level ( $r$ )	0	1	2	3	4	5	6	7
No. of pixel ( $p$ )	0	0	50	60	50	20	10	0

11. a) Explain any lossless compression technique. [5+10]  
 b) Calculate coding redundancy for the given symbols.

Symbol	1	2	3	4	5	6
Probability	0.4	0.2	0.2	0.1	0.05	0.05
Huffman Code	0	10	110	1110	11110	11111

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : PE-EC701C Mobile Communication and Networks

Time Allotted : 3 Hours

Full Marks :70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) SSMA is bandwidth efficient when used with a single user  
State true or false.
- (II) A RAKE receiver collects the \_\_\_\_\_ versions of the original signal.
- (III) Traffic channels carries digitally encoded user data. State true or false
- (IV) Cell splitting increases the number of base stations in order to increase capacity?  
State true or false.
- (V) Why neighboring stations are assigned different group of channels in cellular system?
- (VI) The symbol time in FDMA systems is \_\_\_\_\_ thus intersymbol interference is \_\_\_\_\_
- (VII) Which of the following mechanism do not impact propagation in mobile communication system?  
Reflection, Diffraction, Scattering, Refraction
- (VIII) Cell dragging is a problem occur due to \_\_\_\_\_  
a) Pedestrian users  
b) Stationary users  
c) High speed mobile systems  
d) Base stations having same frequency
- (IX) Diversity decisions are made by \_\_\_\_\_
- (X) In OFDMA, what is the relationship between the subcarrier spacing  $f$  and symbol time  $t$ ?
- (XI) Which is one of the major disadvantages of 2G standards?
- (XII) \_\_\_\_\_ problem occurs when many mobile users share the same channel.

## Group-B (Short Answer Type Question)

Answer any three of the following

[ 5 x 3 = 15 ]

2. What is small scale fading? [ 5 ]
3. Differentiate between FDMA and TDMA [ 5 ]
4. What do you mean by frequency hopping? [ 5 ]
5. How QPSK better than BPSK? [ 5 ]
6. Explain in details the PRN code generation of CDMA [ 5 ]

## Group-C (Long Answer Type Question)

Answer any three of the following

[ 15 x 3 = 45 ]

7. (a) What is frequency allocation? [ 7 ]  
(b) Explain fixed channel allocation (FCA) and dynamic channel allocation (DCA) [ 8 ]
8. (a) Explain two outdoor propagation models in cellular communication. [ 8 ]  
(b) Write a short note on path loss model for indoor propagation in wireless environment [ 7 ]
9. (a) Justify 'Microcell zone concept used to increase Channel Coverage and capacity. [ 8 ]  
(b) Explain the step by step procedure of a mobile originated call [ 7 ]
10. (a) Define Erlang [ 7 ]  
(b) Explain with mathematical expressions "Erlang B" and "Erlang C" formulas. [ 8 ]
11. (a) What is Code Division Multiple Access (CDMA)? Write down the features of the Code Division Multiple Access (CDMA) [ 8 ]

(b) What is WCDMA? What are the main features of WCDMA?

[7]

\*\*\* END OF PAPER \*\*\*



**MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL**

Paper Code : EC501 Electromagnetic Waves

Time Allotted : 3 Hours

Full Marks :70

*The Figures in the margin indicate full marks.**Candidate are required to give their answers in their own words as far as practicable***Group-A (Very Short Answer Type Question)**

1. Answer any ten of the following : [ 1 x 10 = 10 ]
- State Biot-savart law
  - Polarization in electromagnetic wave is caused by \_\_\_\_\_
  - What is the MKS unit for permeability of medium?
  - For a short circuited and open circuited line if their impedances are 5 ohm and 20 ohm, then characteristic impedance is \_\_\_\_\_
  - What is the value of radiation resistance of a  $\lambda/2$  antenna in free space?
  - What is the unit of magnetic flux density?
  - Write the expression for 'displacement current'
  - Compare between lumped circuit and distributed circuit elements.
  - What is the expression of propagation constant of a transmission line in terms of circuit parameters?
  - What is the transmission coefficient when incident and the reflected voltage are given by 15 and 5 respectively?
  - What is the condition for circularly polarized wave travelling in z direction?
  - Find the standing wave ratio, when a load impedance of 250 ohm is connected to a 75 ohm line.

**Group-B (Short Answer Type Question)***Answer any three of the following* [ 5 x 3 = 15 ]

- State and explain Ampere's circuital law [ 5 ]
- Explain the terms 'characteristic impedance' and 'propagation constant' of transmission line. [ 5 ]
- Give the criterion for a material to be a good conductor, perfect dielectric and lossy dielectric. [ 5 ]
- State and prove the boundary conditions at the interface between conductor and dielectric for time varying EM field. [ 5 ]
- Show that a Quarter wave transmission line can be used as an impedance transformer. [ 5 ]

**Group-C (Long Answer Type Question)***Answer any three of the following* [ 15 x 3 = 45 ]

- Explain, from fundamental principle, why an waveguide behaves as an high pass filter. [ 5 ]
  - A rectangular waveguide is propagating in the  $TE_{11}$  mode. Draw its field pattern. How do you extract energy from a wave propagating in this mode of propagation? [ 10 ]
- Why antenna arrays are used? [ 5 ]
  - Write a short note on different types of antenna array? [ 10 ]
- Derive wave equation using Maxwell's equation for uniform plane wave in a conducting medium. [ 7 ]
  - Explain the term 'Skin depth'. [ 4 ]
  - Calculate the skin depth for copper at a frequency of 1000 kHz. ( $\mu = \mu_0, \epsilon = \epsilon_0, \sigma = 5.8 \times 10^7$  mhos/meter) [ 4 ]
- Describe the current distribution and radiation pattern of a folded dipole antenna. [ 3+3 ]  
Find the input impedance of a folded dipole antenna and explain why the antenna has a higher bandwidth compared to half wave dipole antenna. [ 6+3 ]
- When a plane wave is incident normally from dielectric '1' ( $\mu_0, \epsilon_1$ ) onto dielectric '2' ( $\mu_0, \epsilon_2$ ), the electric field of the transmitted wave is 2 times the electric field of the reflected wave. What will be the ratio of  $\epsilon_2/\epsilon_1$ ? [ 5 ]

- (b) For sea water with  $\sigma = 5$  mho/m and  $\epsilon_r = 80$ , what is the distance for which radio signal can be transmitted with 90% attenuation at 25 kHz? [ 5 ]
- (c) State the factors affect the depth of penetration of the wave inside the conducting medium for an electromagnetic wave incident on it. [ 5 ]

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : HS-HU701 Principles of Management

Time Allotted : 3 Hours

Full Marks :70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following : [ 1 x 10 = 10 ]
- (I) Who developed the motivation theory which classifies needs in hierarchical order?
  - (II) what are the skills required for effective leadership?
  - (III) What is decision making?
  - (IV) What is a null hypothesis?
  - (V) What is Brand image?
  - (VI) What is another name of long term planning?
  - (VII) Learning organizations are adaptive to what type of environment?
  - (VIII) What is the first step of recruitment?
  - (IX) Grapevine means what?
  - (X) What are the key traits of leadership?
  - (XI) What is the behavioral feature of the Principles of Management?
  - (XII) What is the primary benefit of MBO?

## Group-B (Short Answer Type Question)

Answer any three of the following [ 5 x 3 = 15 ]

2. Short notes: [ 5 ]  
Steps of MBO
3. What are the internal and external sources of recruitment? [ 5 ]
4. Briefly explain Matrix structure of an organization. [ 5 ]
5. An oil engine manufacturer purchases lubricants at the rate of Rs. 42 per piece from a vendor. The requirements of these lubricants are 1800 per year. What should be the ordering quantity per order, if the cost per placement of an order is Rs.16 and inventory carrying charges per rupee per year is 20 paise? [ 5 ]
6. What are the ten critical decision areas in operations management? [ 5 ]

## Group-C (Long Answer Type Question)

Answer any three of the following [ 15 x 3 = 45 ]

7. (a) List out the levels and functions of management. [ 5 ]  
(b) Explain the contribution of F.W. Taylor and Henri Fayol to management in detail [ 10 ]
8. (a) Define Mission, Vision, objective & Goal [ 5 ]  
(b) Explain the different types of plans and strategies according to the levels of management [ 10 ]
9. (a) What do you mean by formal and informal organization. [ 5 ]  
(b) Discuss the various organization structure. [ 6 ]  
(c) Interpret the concept of strategic and operational planning. [ 4 ]
10. 5S and 3 Mu of Kaizen - discuss [ 5+3 ]  
Explain Six Sigma and DMAIC [ 3+4 ]
11. (a) Great team effectiveness leads to organizational effectiveness-discuss [ 7 ]  
(b) Discrimination Issues Leading to Conflict - elucidate with examples [ 8 ]

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : OE-EC506A Soft Skill and Interpersonal Communication

Time Allotted : 3 Hours

Full Marks :70

*The Figures in the margin indicate full marks.*

*Candidate are required to give their answers in their own words as far as practicable*

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) Define short-term goal.
- (II) Fill in the blank  
\_\_\_\_\_determines the personal characteristics of a successful leader.
- (III) State the following statement is TRUE/FALSE.  
'Don't have much or any control over the outcome of a situation is a cause of stress'
- (IV) State the following statement is TRUE/FALSE.  
'Organizations undergo changes due to new technological, political, and social development that effect them or due to changes in the competitive forces.'
- (V) Who defined motivation as "a general term applied to the entire class of drives, needs, wishes and similar forces."?
- (VI) What is 'out of the box thinking'?
- (VII) What is Job Involvement?
- (VIII) Who defined motivation as "a process that starts with a physiological or physiological deficiency or need that activates behavior or a drive that is aimed at a goal or incentive" ?
- (IX) Explain: "A short-term goal is something you want to do in the near future."
- (X) State the following statement is TRUE/FALSE.  
Teamwork is, "The process of working individually with a group of higher management in order to achieve a goal."
- (XI) Name the decision-making model which is most useful when members are in different locations.
- (XII) Fill the blank-  
\_\_\_\_\_ is the most powerful source for the formation of attitudes.

## Group-B (Short Answer Type Question)

Answer any three of the following

[ 5 x 3 = 15 ]

2. Explain functional aspects of conflict. [ 5 ]
3. Fill in the blanks: [ 5 ]  
\_\_\_\_\_ (High/Low/Moderate) job satisfaction will not eliminate employee turnover but will only help reduce the rate of turnover.
4. With the help of relevant examples differentiate between Leadership Networking and Team work. [ 5 ]
5. With the help of a diagram differentiate between Circle of Control and Circle of concern. [ 5 ]
6. With help of relevant examples explain any five stress busters. [ 5 ]

## Group-C (Long Answer Type Question)

Answer any three of the following

[ 15 x 3 = 45 ]

7. (a) With help of a flow chart explain the elements of Process of Conflict. [ 12 ]  
(b) Differentiate between Conflict and Competition. [ 3 ]
8. With the help of appropriate examples explain different types of decision-making. [ 15 ]
9. (a) Evaluate the importance of Leadership. [ 5 ]  
(b) Evaluate the skills of a good leader. [ 10 ]
10. With the help of relevant examples differentiate between the following- [ 15 ]  
i) Proactive Decision Making and Reactive Decision Making  
ii) Responsive and Intuitive Decision making  
iii) Micro and Macro Decision Making

11. (a) Explain the relationship between-

[ 10 ]

i) Outcomes of Job Satisfaction

ii) Satisfaction and Productivity

iii) Satisfaction and Turnover

iv) Satisfaction and Absenteeism

(b) Explain the important characteristics of job.

[ 5 ]

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : OE-EE501A Data Structure & Algorithm

Time Allotted : 3 Hours

Full Marks :70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

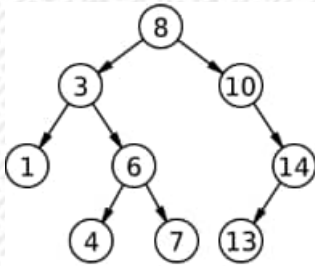
- (I) Process of removing an element from stack is called \_\_\_\_\_
- (II) What is/are the disadvantages of implementing tree using normal arrays?
- (III) What is the advantage of the array data structure?
- (IV) What is a memory efficient double linked list?
- (V) Which data structure do we use for testing a palindrome?
- (VI) The case in which a key other than the desired one is kept at the identified location is called?
- (VII) Consider the usual algorithm for determining whether a sequence of parentheses is balanced. The maximum number of parentheses that appear on the stack AT ANY ONE TIME when the algorithm analyzes:  $((()())())$ ?
- (VIII) \_\_\_\_\_ makes use of a circular linked list
- (IX) A connected planar graph having 6 vertices, 7 edges contains \_\_\_\_\_ regions.
- (X) What is the disadvantage of array data structure?
- (XI) The time complexity used for inserting a node in a priority queue on the basis of key is \_\_\_\_\_
- (XII) A normal queue, if implemented using an array of size MAX\_SIZE, gets full when?

## Group-B (Short Answer Type Question)

Answer any three of the following

[ 5 x 3 = 15 ]

2. Explain Linear and Non-Linear Data Structure. [ 5 ]
3. Write down an algorithm to perform an insertion operation into a simple Queue with an example. [ 5 ]
4. Convert the following infix expression into a postfix expression. [ 5 ]  
Infix expression:  $72-3*(5^2-22)+18/3*2+9-4$
5. Write an algorithm to have the pre-order traversal of the following tree. [ 5 ]



6. Define threaded binary tree along with its type with example. [ 5 ]

## Group-C (Long Answer Type Question)

Answer any three of the following

[ 15 x 3 = 45 ]

7. (a) Write an algorithm to convert infix to prefix conversion using stack. [ 10 ]
- (b) Convert the below infix expression into its equivalent prefix expression: [ 5 ]  
Infix:  $K + L - M * N + (O^P) * W/U/V * T + Q$

8. write an algorithm to perform insertion and deletion operations into a simple queue. Explain with a suitable example. [ 15 ]
9. (a) Write an algorithm to implement the tower of Hanoi problem. [ 5 ]  
(b) Explain Priority queue and double ended queue with proper example. [ 10 ]
10. Define the following terms with a proper example: Strictly Binary tree, Complete binary tree, and extended binary tree [ 15 ]
11. Create a B-tree of order 5 with the following list of elements: [ 15 ]  
10,70,60,20,110,40,80,130,100,50,190,90,180,240,30,120,140,160

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : PE-EE501C Renewable & Non Conventional Energy

Time Allotted : 3 Hours

Full Marks :70

*The Figures in the margin indicate full marks.*

*Candidate are required to give their answers in their own words as far as practicable*

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) What is the main source for the formation of Wind?
- (II) The process of producing energy by utilizing heat trapped inside the earth surface is called \_\_\_\_\_
- (III) What is ocean thermal energy conversion?
- (IV) By what means can hydrogen be stored?
- (V) When Electricity is generating from solar cells, then it is generated from \_\_\_\_\_
- (VI) The main purpose of Wind Generator and Wind Mills is for \_\_\_\_\_
- (VII) Which of the following produces desalinated fresh water?
- (VIII) How is the vapourised working fluid condensed in a closed-cycle ocean thermal energy conversion system?
- (IX) How does the hot water or steam escape through earth surface?
- (X) What are the types of Geothermal energy resources?
- (XI) Select the Non-conventional energy sources from the following terms  
 (A). Renewable energy (B). Non-renewable energy  
 (C). Produced from electricity (D). Produced from heat
- (XII) From Sunlight which is coming out and responsible to hit and penetrate in the panel of Solar Cells?  
 (A). Dust particles (B). Photons (C). Electrons (D). Protons

## Group-B (Short Answer Type Question)

*Answer any three of the following*

[ 5 x 3 = 15 ]

2. What is the basic principle to fabricate a solar cell? [ 5 ]
3. What is the basic equation of wind power? Derive it to get wind energy conversion systems? [ 5 ]
4. How the solar radiation can be measured on the surface of Earth? [ 5 ]
5. What is Solar collector? Name different types of solar collector. [ 5 ]  
What are the material used to make a solar collector?
6. How does the collection of Solar Energy is affected by tilting a Flat plate collector with respect to ground surface? [ 5 ]  
What is Tilt factor?

## Group-C (Long Answer Type Question)

*Answer any three of the following*

[ 15 x 3 = 45 ]

7. Describe different types of Biomass energy plants and their constructional features with neat sketches. [ 15 ]
8. What are the different components of Environment? What environment components are created by the conventional power Plants? [ 15 ]
9. What is spectral energy distribution of solar radiation? Give a sketch and explain. [ 15 ]
10. Write the names of main greenhouse gases (GHG) and their sources. Explain their effects on human body. [ 15 ]
11. Explain, why the temperature increases with the increase in depth of penetration into the Earth center. [ 15 ]

\*\*\* END OF PAPER \*\*\*





# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : HM-EE 701 Principle Of Management

Time Allotted : 3 Hours

Full Marks :70

*The Figures in the margin indicate full marks.*

*Candidate are required to give their answers in their own words as far as practicable*

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) Define organizing.
- (II) Mention the importance of motivation.
- (III) What is production management?
- (IV) Define management.
- (V) Define corporate planning.
- (VI) State the advantages of organization.
- (VII) Which of the following are sub- groupings of the classical approach?
- (VIII) State any four limitations of planning.
- (IX) What are the advantages of decentralization?
- (X) Mention the importance of Leadership
- (XI) Explain the term decision and decision making.
- (XII) State the importance of HRM?

## Group-B (Short Answer Type Question)

*Answer any three of the following*

[ 5 x 3 = 15 ]

2. "pinciples of management achieve results economically".Explain? [ 5 ]
3. What is planning? Explain the various steps involved in Planning. [ 5 ]
4. What is the role of scientific management in the modern era? [ 5 ]
5. Explain the qualitative forecasting. [ 5 ]
6. Do you think you're up-to-date on existing Supply Chain Management Trends? [ 5 ]

## Group-C (Long Answer Type Question)

*Answer any three of the following*

[ 15 x 3 = 45 ]

7. Explain the Planning Premises. [ 15 ]
8. How does informal organisation support the formal organisation? [ 15 ]
9. Discuss the various steps involved in the'decision-making process ". [ 15 ]
10. What is marketing mix? Discuss the elements of marketing mix and it's implications in marketing planning. [ 15 ]

Lately the business was expanding due to good quality and reasonable prices. Also with more people working the market for processed food was increasing. New players were also coming to cash in on the new trend. In order to keep its market share in the short run the company directed its existing workforce to work overtime. But this resulted in many problems. Due to increased pressure of work the efficiency of the workers declined. Sometimes the subordinates had to work for more than one superior resulting in declining efficiency. The divisions that were previously working on one product were also made to work on two or more products. This resulted in a lot of overlapping and wastage. The workers were becoming undisciplined. The spirit of teamwork, which had characterised the company, previously was beginning to wane. Workers were feeling cheated and initiative was declining. The quality of the products was beginning to decline and market share was on the verge of decrease.

Actually the company had implemented changes without creating the required infrastructure.

- a. Identify the Principles of Management (out of 14 given by Henry Fayol) that were being violated by the company.
- b. Explain these principles in brief.
- c. What steps should the company management take in relation to the above principles to restore the company to its past glory?

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : PC-EE504 Power Electronics

Time Allotted : 3 Hours

Full Marks :70

*The Figures in the margin indicate full marks.*

*Candidate are required to give their answers in their own words as far as practicable*

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) What is/are the limitation(s) of single phase half-wave rectifiers?
  - a) Large ripple factor
  - b) Poor utilization of transformer
  - c) Chances of transformer core saturation
  - d) All of the above
- (II) In a boost chopper, if  $V_s = 100$  V and the chopper is operated at a duty cycle of 50 %. Then find the output voltage.
  - a) 50 V
  - b) 100 V
  - c) 150 V
  - d) 200 V
- (III) Which of the following parameters is maintained constant in VSI?
  - a) Inverter input voltage
  - b) Inverter input current
  - c) Load impedance
  - d) Switching duty ratio
- (IV) In which of the following region, should a power BJT operate in power electronic converters?
  - a) Active region
  - b) Cut-off and saturation region
  - c) Active and cut-off region
  - d) Active, cut-off and saturation region
- (V) Which of the following is true for a thyristor?
  - a) The holding current is almost equal to the latching current
  - b) The holding current is almost half of the latching current
  - c) The holding current is almost double to the latching current
  - d) The holding current can be less than, equal or more than the latching current
- (VI) What is the volt-amp operating region of a single phase full bridge rectifier using two thyristors and two diodes?
  - a) Both voltage and current positive
  - b) Voltage is positive, but current can be positive or negative
  - c) Voltage can be positive or negative, but current is positive
  - d) Both voltage and current can be positive or negative
- (VII) How thyristors can be saved from unwanted  $dv/dt$  turn-on?
  - a) Connecting fuse in series with thyristor
  - b) Connecting inductor in series with thyristor
  - c) Connecting capacitor across with thyristor
  - d) Using large heat sink
- (VIII) What is the PIV rating of each diode of a three phase half-bridge rectifier?
  - a)  $V_m$  (where,  $V_m$  is the amplitude of phase voltage)
  - b)  $2V_m$  (where,  $V_m$  is the amplitude of phase voltage)
  - c)  $\sqrt{3}V_m$  (where,  $V_m$  is the amplitude of phase voltage)
  - d)  $3V_m$  (where,  $V_m$  is the amplitude of phase voltage)
- (IX) What will be the output voltage, if the switch of a buck chopper is kept OPEN continuously?
  - a)  $V_o = 0$
  - b)  $V_o = \infty$
  - c)  $V_o =$  supply voltage
  - d)  $V_o \leq$  supply voltage

- (X) Which of the following signals are used in sinusoidal PWM control?
- square wave as reference signal and triangular wave as carrier signal
  - triangular wave as reference signal and square wave as carrier signal
  - sinusoidal wave as reference signal and triangular wave as carrier signal
  - triangular wave as reference signal and sinusoidal wave as carrier signal
- (XI) Which type of commutation techniques are to be used in DC-DC converters (made of thyristors)?
- Natural commutation
  - Load commutation
  - Forced commutation
  - Any of the above
- (XII) Which of the following parameters, the commutation or overlap angle of a single-phase full bridge rectifier depend(s) on?
- Source inductance
  - Load current
  - Supply frequency
  - All of the above

**Group-B (Short Answer Type Question)**

Answer any three of the following

[ 5 x 3 = 15 ]

- Explain the gate characteristics of a SCR with the boundaries. [ 5 ]
- What is the peak current rating of each diode of a single phase controlled bridge rectifier supplied with 230 V, 50 Hz. A.C. supply, operating with a firing angle of  $30^\circ$  and feeding a 10 Ohm resistive load? Also, determine the average load voltage. [ 5 ]
- Explain in brief the additional circuitry required for series operation of SCRs [ 5 ]
- A single phase full bridge controlled rectifier with an a.c. supply of 220 V, 50 Hz supplies a highly inductive load drawing a current of 10 A. What should be the firing angle to get an average output voltage of 100 V across the load? [ 5 ]
- A single phase full bridge controlled rectifier with a free-wheeling diode across the load with an a.c. supply of 230 V, 50 Hz supplies a highly inductive load drawing a current of 10 A. What will be the average output voltage, if they are triggered at a firing angle of  $20^\circ$ . What is the peak current stress of the free-wheeling diode? [ 5 ]

**Group-C (Long Answer Type Question)**

Answer any three of the following

[ 15 x 3 = 45 ]

- (a) Explain the working principle and draw the volt-amp characteristics of a SCR. [ 10+2+3 ]  
(b) Define holding and latching current.  
(c) Draw the equivalent circuits of a SCR under forward and reverse biased condition.
- (a) Derive the expression of average output voltage of a full wave controlled rectifier fed with single phase A.C. supply having source inductance and feeding a highly inductive load in continuous conduction mode. [ 10+5 ]  
(b) Also draw the waveforms of supply voltage, output voltage and waveform of current drawn from input supply.
- (a) Explain in brief the current conduction phenomenon through a p-n junction. [ 7+4+4 ]  
(b) Draw the simple cross-sectional structure of a power diode and explain the significance of drift region.  
(c) Explain the reverse recovery phenomenon of p-n junction.
- (a) Explain with circuit diagram the necessity and working principle of di/dt protection circuit of SCR. [ 6+7+2 ]  
(b) Explain with circuit diagram the operating principle of resistor firing circuit of thyristors.  
(c) What is the firing angle range of resistor and R-C firing circuits of thyristors.
- Write short notes. [ 5+5+5 ]  
(a) Single PWM Inverter  
(b) Bi-polar inverter  
(c) Series inverter control technique.

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : OE-EE 702 C Computer Network

Time Allotted : 3 Hours

Full Marks :70

*The Figures in the margin indicate full marks.*

*Candidate are required to give their answers in their own words as far as practicable*

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following : [ 1 x 10 = 10 ]
- (I) Write full form of UDP
  - (II) What HTTPS means?
  - (III) What are the main networking components?
  - (IV) What are Routers?
  - (V) What is Link Control Protocol (LCP)?
  - (VI) Write functions of a Switch.
  - (VII) What is BGP in networking?
  - (VIII) What is secret key in encryption?
  - (IX) What is simplex communication?
  - (X) Give the relationship between propagation speed and propagation time.
  - (XI) Explain cross talk and what is needed to reduce it?
  - (XII) Is Ethernet a wireless?

## Group-B (Short Answer Type Question)

*Answer any three of the following*

[ 5 x 3 = 15 ]

2. Compare datagram networks and virtual circuit networks. [ 5 ]
3. What is HDLC and what is its role in networking? [ 5 ]
4. Differentiate between IPv4 and IPv6. [ 5 ]
5. What are the advantages of Ethernet? [ 5 ]
6. Why CSMA is used? [ 5 ]

## Group-C (Long Answer Type Question)

*Answer any three of the following*

[ 15 x 3 = 45 ]

7. (a) What Is Circuit Switching? [ 3 ]  
 (b) What is Packet Switching? [ 2 ]  
 (c) Write Advantages and Disadvantages of Circuit Switching [ 5 ]  
 (d) Write Advantages and Disadvantages of Packet Switching [ 5 ]
8. (a) What is Quality of service? [ 4 ]  
 (b) Write some techniques to improve the QoS. [ 5 ]  
 (c) What is Leaky bucket algorithm? [ 3 ]  
 (d) What is Token bucket algorithm? [ 3 ]
9. (a) Write a short note on TDM. [ 3 ]  
 (b) Write a short note on FDM. [ 3 ]  
 (c) Write the differences between Circuit Switching and Packet Switching. [ 5 ]  
 (d) What is the difference between Hub, Switch, and Router? [ 4 ]
10. Describe the selective repeat ARQ protocol in computer networks. [ 15 ]
11. What are the different flow control protocols? Explain them with proper diagrams. [ 15 ]

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : PC-EE503 Control system

Time Allotted : 3 Hours

Full Marks :70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) What are compensating networks?
- (II) Define state model of nth order system?
- (III) What is control system?
- (IV) Define Corner frequency.
- (V) What is steady state response?
- (VI) What is bandwidth?
- (VII) What are the constant M and N circle?
- (VIII) What are the effects of lag-lead compensators?
- (IX) Define state equation:
- (X) What is block diagram?
- (XI) How a control system is classified depending on the value of damping?
- (XII) List the basic elements of translational mechanical systems.

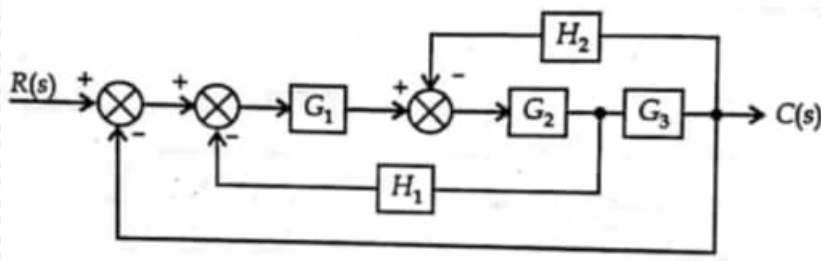
## Group-B (Short Answer Type Question)

Answer any three of the following

[ 5 x 3 = 15 ]

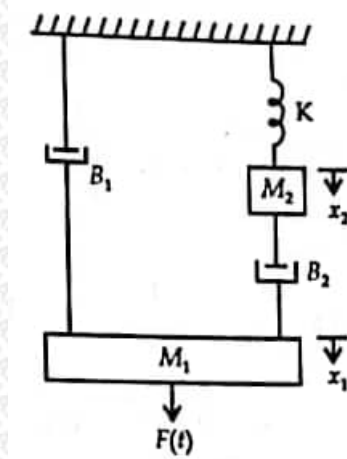
2. Determine the transfer function  $C(s)/R(s)$  for the system shown in Figure.

[ 5 ]

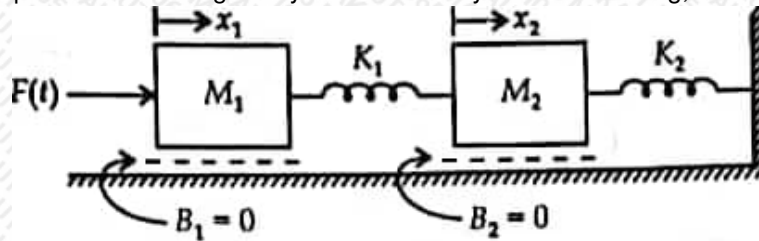


3. Draw the mechanical equivalent network of the system shown in Fig.. Also draw the electrical analogous circuit and write the set of equation using f-v and f-i analogy.

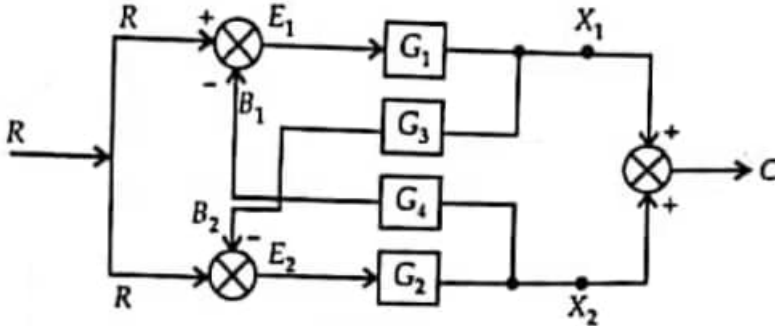
[ 5 ]



4. Write the differential equations describing the dynamics of the system shown in fig, and find the  $X_2(s)/F(s)$ . [5]



5. Determine the transfer function  $C(s)/R(s)$  for the system shown in Figure. [5]



6. Find the state equations for the translational mechanical system shown in Figure. [5]

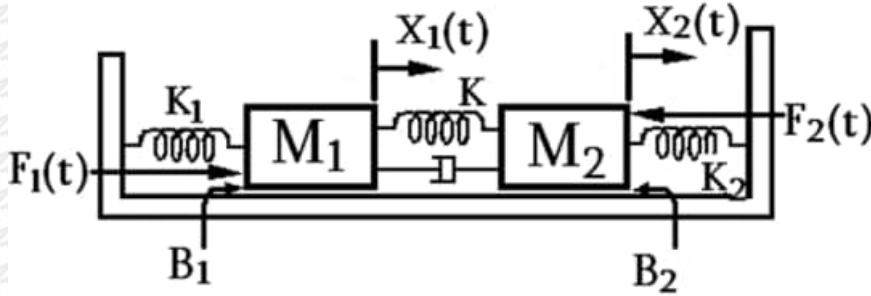


Figure: Spring, mass and damper system

**Group-C (Long Answer Type Question)**

Answer any three of the following

[15 x 3 = 45]

7. (a) What are the advantages of Routh Hurwitz stability criterion? [2]  
 (b) Draw the ROOT LOCUS plot and determine the stability: [13]

$$G(s) = \frac{k(s+2)}{s(s+1)(s^2+4s+8)}$$

8. (a) Derive the expression for response of the first order system with unit Step input. [5]  
 (b) Derive the expression for response of the first order system with unit Ramp input. [5]  
 (c) Derive the expression for response of the first order system with Parabolic input. [5]

9. (a) Use Laplace Transform method to determine time response of a system having state model as [5]

$$\dot{x}_1 = x_2 + u(t)$$

$$\dot{x}_2 = -2x_1 - 3x_2$$

Were,  $u(t) = e^{-t}$  for  $t \geq 0$

$$= 0 \text{ for } t < 0$$

And  $x_1(0) = x_2(0) = 0$



(b) Consider the system matrix [ 10 ]

$$A = \begin{bmatrix} 0 & 6 & -5 \\ 1 & 0 & 2 \\ 3 & 2 & 4 \end{bmatrix}$$

Determine the following,

- Eigen value
- Eigen vector
- Vander mode matrix
- Modal matrix
- Diagonal matrix.

10. (a) What is the relation between stability and coefficient of characteristic polynomial? How the roots of characteristic equation are related to stability? What is limitedly stable system? [ 5 ]

(b) The open loop transfer function of a control system is given by [ 10 ]

$$G(s) = \frac{K}{s(s+2)(s+10)}$$

Determine the value of K so that the system may be stable with

- Gain margin equal to 6 dB
- Phase margin equal to 45 degree.

11. (a) Use Nyquist criterion, determine whether the closed loop system having the following open loop transfer function is stable or not. If not, how many closed loop poles lie in the right half of the s-plane? [ 10 ]

$$G(s)H(s) = \frac{1+4s}{s^2(1+s)(1+2s)}$$

(b) Use Nyquist criterion, determine whether the closed loop system having the following open loop transfer function is stable or not. Derive an expression for gain K in terms of  $T_1$ ,  $T_2$  and specified gain margin. [ 5 ]

$$G(s)H(s) = \frac{k}{s(1+sT_1)(1+sT_2)}$$

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : PC-EE502 Power System-I

Time Allotted : 3 Hours

Full Marks :70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) Which of the following insulation is used in cables?
  - i) varnished cambric
  - ii) rubber
  - iii) paper
  - iv) any of the above
- (II) The length of the short transmission line is upto-
  - i) 50 km
  - ii) 120 km
  - iii) 200 km
  - iv) 250 km
- (III) The tariff in which power factor is taken as reference-
  - i) Sliding scale tariff
  - ii) kVA maximum demand tariff
  - iii) kW and kVAR tariff
  - iv) All of these
- (IV) The knowledge of diversity factor helps in determining-
  - i) Plant capacity
  - ii) Average load
  - iii) Peak load
  - iv) kWh generated
- (V) The power loss in an overhead transmission line is mainly due to.....
- (VI) In a 33 kV overhead line, there are 3 units in the string of insulators. The voltage across the string is-
  - i)  $33 / \sqrt{3}$  kV
  - ii) 33 kV
  - iii) 66 kV
  - iv) none of above
- (VII) Voltage distribution across disc of strings of suspension insulator assembly is \_\_\_\_\_
- (VIII) In a cable immediately above metallic sheath \_\_\_\_\_ is provided-
  - a) earthing connection
  - b) bedding
  - c) armouring
  - d) none of the above
- (IX) In any transmission line,  $AD - BC =$  \_\_\_\_\_ -
  - i) 1
  - ii) 2
  - iii) 3
  - iv) 4
- (X) A tariff on imports benefits domestic producers of the imported good because-
  - i) They get the tariff revenue
  - ii) It raises the price for which they can sell their product on the domestic market
  - iii) It prevents imports from rising above a specified quantity
  - iv) It reduces their producer surplus, making them more efficient

- (XI) A hydroelectric station is supplied from a catchment area of  $150 \text{ km}^2$  with annual rainfall of 200 cm and effective head of 300 m. The yield factor is 60%. The available power is-
- 15420 kW
  - 16787 kW
  - 13240 kW
  - 12408 kW
- (XII) An overhead line conductor has a cross sectional area of  $3.2 \text{ cm}^2$ . It is supported on level supports of a span of 150 m. The specific weight of the conductor is  $7800 \text{ kg/m}^3$ , and the working stress is  $1050 \text{ kg/cm}^2$ . What is the working tension?
- 1560 kg
  - 2416 kg
  - 3360 kg
  - 986 kg

**Group-B (Short Answer Type Question)**

Answer any three of the following

[ 5 x 3 = 15 ]

- What factors are taken into account while selecting the site for a steam power station? [ 5 ]
- What are the main components of overhead lines? [ 5 ]
- Define corona. What are the factors effecting corona? [ 5 ]
- What are the different types of tests carried out on overhead line insulators? [ 5 ]
- What are the properties of line supports? [ 5 ]

**Group-C (Long Answer Type Question)**

Answer any three of the following

[ 15 x 3 = 45 ]

- Explain the performance of medium transmission line using nominal T-method. [ 6 ]
  - Derive the value of ABCD constants for short transmission line. [ 4 ]
  - What is the effect of load power factor on the regulation and efficiency of transmission line? [ 5 ]
- Derive the expression of string efficiency. [ 6 ]
  - What are the methods of improving string efficiency? [ 4 ]
  - What are the advantages of suspension type insulators? [ 5 ]
- Derive the expression of inductance of a three phase overhead line for symmetrical spacing. [ 5 ]
  - A 3-phase line has conductors 2cm in diameter spaced equilaterally 1m apart. If the dielectric strength of air is 30 kV (max) per cm, find the disruptive critical voltage for the line. Take air density factor  $\delta = 0.952$  and irregularity factor  $m_0 = 0.9$ . [ 5 ]
  - Explain power loss due to corona and also mention the methods of reducing corona. [ 5 ]
- Explain strain insulators. [ 5 ]
  - What are the key points regarding the potential distribution over a suspension type insulators? [ 5 ]
  - How is porcelain produced? Write the properties of porcelain. [ 5 ]
- Explain the performance of long transmission line using rigorous method. [ 7 ]
  - Determine the generalised constants of medium transmission line using nominal T and nominal  $\pi$  method. [ 8 ]

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : OE-EE 701 A Artificial Intelligence

Time Allotted : 3 Hours

Full Marks :70

*The Figures in the margin indicate full marks.*

*Candidate are required to give their answers in their own words as far as practicable*

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following : [ 1 x 10 = 10 ]
- (I) Give example of 'Tautology and 'Contradiction' in terms of Boolean expression.
  - (II) What is time complexity of min-max algorithm?
  - (III) Name anyone well known Expert System for medical diagnosis systems.
  - (IV) What do you mean by optimal search?
  - (V) What is the heuristic function of greedy best-first search?
  - (VI) Show that  $P \text{ AND } (\text{not } P)$  is a contradiction.
  - (VII) A formula with no free variable is called \_\_\_\_\_.
  - (VIII) When a predicate formula is called NOT valid?
  - (IX) Which values are inserted in alpha and beta values in Alpha-Beta cut algorithm?
  - (X) Truth value of Fuzzy logic belongs in the range \_\_\_\_\_.
  - (XI) Mention two properties where heuristic search is different from other searches.
  - (XII) "No one can fool everyone all the time" - convert it into predicate logic.

## Group-B (Short Answer Type Question)

*Answer any three of the following* [ 5 x 3 = 15 ]

2. Define a well-formed formula (wff). Explain Tautology and Contradiction with example. [ 5 ]
3. Explain A\* algorithm with an example. [ 5 ]
4. Explain Uniform Cost search with an example. How is it superior than BFS and DFS? [ 5 ]
5. When a production system is called commutative production system? With example explain the characteristics of commutative production system. [ 5 ]
6. Discuss limitations of Min-Max algorithm. How it can be improved using alpha-beta cut method. [ 5 ]

## Group-C (Long Answer Type Question)

*Answer any three of the following* [ 15 x 3 = 45 ]

7. (a) What is production system? Explain it with an example. Discuss the Characteristics of a production system. [ 1+2+3 ]  
 (b) Discuss various approaches and issues in knowledge representation. Also discuss various Problems in representing knowledge. [ 6 ]  
 (c) What is nonmonotonic reasoning? Explain the logics used for nonmonotonic reasoning. [ 3 ]
8. (a) Explain the resolution procedure in detail [ 5 ]  
 (b) Explain the Unification used for reasoning under predicate logic with example [ 5 ]  
 (c) Explain how a constraint satisfaction problem (CSP) may be solved with example. [ 5 ]
9. (a) Explain goal based agent. [ 6 ]  
 (b) Discuss any puzzle that can be solved using a goal based agent. You can use any heuristic method to design the agent. [ 9 ]
10. (a) A problem solving search can proceed in either the forward or backward direction. What factors determine the choice of direction for a problem? [ 5 ]  
 (b) Prove Breadth First, Depth First and Uniform cost search is special case of Best first search. [ 5 ]  
 (c) Prove Uniform cost search is a special case of A\* [ 5 ]

11. (a) Explain in detail the architecture of Mc Culloch – Pitts neuron model and also realize 3-input NAND gate, NOR gate using the above neuron model [ 5 ]
- (b) Explain about back propagation learning. [ 5 ]
- (c) Write short notes on Hopfield networks. [ 5 ]

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : PE-EE 701 C Power Generation Economics

Time Allotted : 3 Hours

Full Marks :70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) The other name of two-part tariff is \_\_\_\_\_
- (II) The shutdown cost of a system is usually considered as \_\_\_\_\_
- (III) The Lagrangian multiplier for load scheduling is denoted by \_\_\_\_\_
- (IV) Least square estimation is one of the techniques of power system for \_\_\_\_\_
- (V) The decrease in the cost of power plant due to its use is called \_\_\_\_\_
- (VI) The other name of three-part tariff is \_\_\_\_\_
- (VII) The constraints which are due to the balancing of load demand and generation output are called \_\_\_\_\_
- (VIII) For determining the solution for optimal generation initially \_\_\_\_\_ is assumed.
- (IX) Weighted Least square estimation is one of the techniques of power system for \_\_\_\_\_
- (X) Hydel power plant can be used as \_\_\_\_\_ load plant.
- (XI) For a generating plant Utilization factor is always less than 1. True or False.
- (XII) The variable charge of availability based tariff is:

## Group-B (Short Answer Type Question)

Answer any three of the following

[ 5 x 3 = 15 ]

2. What is block rate tariff? Explain by a diagram/graph. Which type of consumers are mainly subjected to this tariff? [ 5 ]
3. What is incremental fuel cost with reference to hydro generating units? [ 5 ]
4. A consumer has a maximum demand of 500 kW at 30% yearly load factor. If the tariff is Rs 100 per kW of maximum demand plus 20 paise per kWh, find the overall cost per kWh. [ 5 ]
5. Two units of a plant have fuel costs of [ 5 ]  
 $F_a = 0.4 P_1^2 + 10 P_1 + 25$  Rs/hr  
 $F_b = 0.35 P_2^2 + 6 P_2 + 20$  Rs/hr  
 If the load supplied is 220 MW, find the optimal division of load between two generators neglecting transmission losses.
6. The fuel cost of generators G1 and G2 are  $C_1(P_{G1}) = 10,000$  Rs/MWhr and  $C_2(P_{G2}) = 12,500$  Rs/MWhr and the loss in the line is  $P_{l.p.u.} = 0.5 \times P_{G1(pu)}^2$  where the loss coefficient is specified in p.u. on a MVA base. Find the most economic power generation schedule for load of 40 MW. [ 5 ]

## Group-C (Long Answer Type Question)

Answer any three of the following

[ 15 x 3 = 45 ]

7. (a) What are the benefits and drawbacks of tariff system? [ 5 ]  
 (b) Compare three-part, two-part and block rate tariff systems. Give a graphical/diagrammatic representation of the given tariff systems. [ 10 ]
8. Write notes on the following: [ 15 ]  
 (i) Spinning reserve  
 (ii) Penalty factor of a unit  
 (iii) Constraints in unit commitment.
9. (a) What are the important criteria for selection of number and size of generating units. [ 5 ]

(b) A proposed station has the following daily load cycle:

[ 10 ]

Time in hours	6-8	8-11	11-16	16-19	19-22	22-24	24-6
Load in MW	20	40	50	35	70	40	20

Draw the load curve and select suitable generator units from the 10, 20, 25 and 30 MVA. Prepare the operation schedule for the machines selected and determine the load factor from the curve.

10. (a) What is meant by availability base tariff? What is the motive of applying such tariff? [ 7 ]
- (b) Determine the load factor at which the cost of supplying a unit of electricity from a hydel and steam station is same if the annual fixed charge for hydel station is Rs 300 per kW and for steam station is Rs 1200 per kW as well as running charges for hydel station is 25 paise per kWh and for steam station is 6.25 paise per kWh. [ 8 ]
11. (a) What is sinking fund method of finding depreciation of a power plant? [ 8 ]
- (b) The equipment in a power station costs Rs 15,60,000 and has a salvage value of Rs. 60,000 at the end of 25 years. Determine the value of the equipment at the end of 20 years by sinking fund method at 5% compound interest annually. [ 7 ]

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : PE-EE 701 B Electrical Energy Conservation & Auditing

Time Allotted : 3 Hours

Full Marks :70

*The Figures in the margin indicate full marks.*

*Candidate are required to give their answers in their own words as far as practicable*

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) Recall and write the country which has major chunk of coal reserves in the Globe
- (II) Define Power factor.
- (III) Mention the application of Combustion analyzer
- (IV) Mention the factors affecting the speed of an AC motor
- (V) Comment on the efficiency of backward curved fans compared to forward curved fans
- (VI) State the function that can not be achieved using automatic power factor controllers.
- (VII) Define energy intensity of a country.
- (VIII) Calculate the energy consumed by a 50 kW motor loaded at 40 kW over a period of 4 hour.
- (IX) Indicate the skills to be possessed by a typical Energy manger
- (X) Compute the kVA<sub>r</sub> rating required for improving the power factor of a load operating at 500 kW and 0.85 power factor to 0.95.
- (XI) What do you understand from the term "Designated Consumer" in Energy Conservation Act 2001
- (XII) The latent heat of condensation of 1 kg of steam at 100 °C to form water at 100 °C, Calculate the heat energy emitted during the process.

## Group-B (Short Answer Type Question)

Answer any three of the following

[ 5 x 3 = 15 ]

2. Present the classification of types of energy available in earth and give examples for each one of them [ 5 ]
3. Differentiate the terms 'specific heat' and 'heat capacity' using apt examples [ 5 ]
4. Define Sanctioned Demand and explain its role in demarcation of consumers [ 5 ]
5. Explain the terms fusion, melting point and vaporization of a substance. [ 5 ]
6. Differentiate Energy Conservation and Energy Efficiency with suitable examples [ 5 ]

## Group-C (Long Answer Type Question)

Answer any three of the following

[ 15 x 3 = 45 ]

7. (a) With suitable examples, elucidate how energy efficiency practices can an Industry. [ 7 ]  
(b) With suitable examples, explain the benefits a nation and world can attain by ensuring energy efficiency in production and consumption sectors [ 8 ]
8. (a) Describe the merits of using steam in industries using suitable examples [ 8 ]  
(b) Define heat transfer. Briefly explain three primary modes of heat transfer. [ 7 ]
9. (a) Explain the salient features of Energy Conservation act 2001 [ 8 ]  
(b) List the major schemes brought by BEE and explain any one of them [ 7 ]
10. (a) Mention the losses accrued in an 'induction motor' and explain each type of loss [ 10 ]  
(b) Define synchronous speed and write the equation to calculate the slip of an induction motor [ 5 ]
11. (a) Explain the ways to assess the performance of fans utilized in industries. [ 9 ]  
(b) List the parameters to be considered for selection of an industrial fan [ 6 ]

\*\*\* END OF PAPER \*\*\*





# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : PC-EE501 Electric machine-II

Time Allotted : 3 Hours

Full Marks :70

*The Figures in the margin indicate full marks.*

*Candidate are required to give their answers in their own words as far as practicable*

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following : [ 1 x 10 = 10 ]
- (I) What is full pitched winding?
  - (II) Peak value of fundamental component of MMF produced by one N-turn coil carrying a current 'i' is
  - (III) Which one of the following method would give a higher than actual value of regulation of an alternator:
  - (IV) What should be the maximum possible speed in rpms of 50Hz and 60Hz alternator?
  - (V) The power factor of an alternator under short circuit condition is almost
  - (VI) A 3- phase induction motor is running from 3-phase source at a constant load. If fuse in one line is suddenly blow off, the motor-
  - (VII) The armature mmf wave in dc machine
  - (VIII) What is the general magnitude of step angle of variable reluctance stepping motor?
  - (IX) In star-delta starting of squirrel cage induction motor compared to DOL starting the starting current and torque are
  - (X) How the direction of rotation of single phase induction motor can be reversed by
  - (XI) In round rotor alternator, reactive power is maximum at a load angle
  - (XII) Which of the following harmonics are present in the resultant MMF produced by 3 phase currents flowing in the 3 phase windings?

## Group-B (Short Answer Type Question)

*Answer any three of the following*

[ 5 x 3 = 15 ]

2. Give the physical concepts about the production of electromagnetic torque in rotating electrical machine. [ 5 ]
3. What are the assumption made for determining the coil mmf in rotating machine and what are the assumption is made for current sheet concept? [ 5 ]
4. Explain the following term with respect to rotating machine- Pole pitch, coil side, full pitched coil, chorded coil, chording angle, coil span. [ 5 ]
5. Find the amplitude of mmf produced by a squirrel cage winding. [ 5 ]
6. Discuss the power angle characteristics of cylindrical rotor synchronous machine [ 5 ]

## Group-C (Long Answer Type Question)

*Answer any three of the following*

[ 15 x 3 = 45 ]

7. (a) Discuss the advantage of using fractional pitch winding. [ 4 ]  
 (b) Why is some parts of electrical machine is laminated? [ 2 ]  
 (c) A three phase 4 pole 50 Hz star connected turbo-generator has distributed field winding of 140 turns and winding factor is 0.96. Its other data as under Armature series turn per phase=42, armature radius=0.4m, armature length =4m, gap length= 2cm, winding factor of the armature winding =0.955. For no load armature emf of 11kv, find the value of field current required. [ 9 ]
8. (a) what should be the value of chording angle for eliminating the fifth and 7th harmonics from the phase emf. [ 5 ]  
 (b) A cylindrical rotor machine has following parameter- [ 10 ]  
 Rotor diameter=0.4m, l=1m, stator bore diameter=0.41m, peak value of sinusoidal flux density=1 T.  
 Calculate the air gap reluctance, flux per pole, total air gap energy.
9. (a) Give the physical concept of pulsating stationary flux. [ 5 ]

- (b) A 3 phase 3 KV, 50Hz, 300 rpm alternator has following data- [ 10 ]  
Armature diameter =1.9 m, core length= 0.35m, peak air gap flux density=0.65T, no. of stator slots=180, air gap length=1 cm. this alternator has single layer winding and two circuit per phase. Find the total armature turn per phase. Assume sinusoidal flux distribution.. the winding is short pitched by one slot.. Calculate the peak value of fundamental mmf.
10. (a) Explain why the rotor of a poly phase induction motor can never attain synchronous speed. [ 4 ]  
(b) A 20KW 6-pole 400v 50Hz 3-phase induction motor has a full load slip of 0.02. If the torque lost in mechanical losses ( friction and windage) is 20Nm, find the rotor ohmic loss, motor input and efficiency. Stator losses total 900 watts. [ 8 ]  
(c) Discuss the condition under which optimum torque developed in 3- phase induction motor. [ 3 ]
11. (a) In an alternator show that the output emf wave cannot contain even harmonic. [ 7 ]  
(b) For a 3 phase winding with 3 slot per pole per phase and coil span of 8 slots, compute the breadth and pitched factors. The flux density wave in the air gap of this machine found to have 20% third harmonic. Calculate the percentage increase in per phase rms emf due to harmonic [ 8 ]

\*\*\* END OF PAPER \*\*\*

**MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL**

Paper Code : PC-EE 701 Electric Drive

Time Allotted : 3 Hours

Full Marks :70

*The Figures in the margin indicate full marks.**Candidate are required to give their answers in their own words as far as practicable***Group-A (Very Short Answer Type Question)**

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) Why stator voltage control is suitable for speed control of induction motors in fan and pump drive?
- (II) The magnetization current drawn from an AC supply a synchronous motor is used to \_\_\_\_\_
- (III) What is a multi motor electric drive? Give some examples.
- (IV) What are the types of electric drives?
- (V) What is commutation in thyristor power converter?
- (VI) Slip power recovery scheme can be applied to \_\_\_\_\_ motor.
- (VII) How a motor rating is determined in a continuous duty and Variable load?
- (VIII) Regenerative braking is not possible in \_\_\_\_\_ motor.
- (IX) Mention two drawbacks of cycloconverter.
- (X) Why is 3-phase half-controlled rectifier not generally employed in the industrial application?
- (XI) What is the torque expression of switched reluctance motor?
- (XII) what is the relationship of  $V_{dc}$  and  $V_{ac}$  in terms of firing angle  $\alpha$  for a full controlled converter drive?

**Group-B (Short Answer Type Question)***Answer any three of the following*

[ 5 x 3 = 15 ]

2. The temperature rise of motor when operating for 25 min on full load is  $25^{\circ}\text{C}$  and becomes  $40^{\circ}\text{C}$  when the motor operates for another 25 min on same load. Determine heating time constant and steady state temperature. [ 5 ]
3. A drive has the following parameter : [ 5 ]  
 $T = 150 - 0.1N$ , N-M, where N is the speed in rpm.  
Load torque  $T_L = 100$  N-M  
Initially drive is operating at steady state. The characteristics of the load torque are changed to  $T_L = -100$  N-M. calculate the initial & final equilibrium speeds.
4. Deduce the torque speed relationship of a d.c series motor and draw the curve and explain critically the effect of saturation. [ 5 ]
5. Show that during starting, if the slip of induction machine running under no load friction torque changes from 1 to 0. the energy lost in the rotor circuit is given as [ 5 ]  
 $W_{st} = 1/2 J \omega_s^2$  Joules. The symbols have their usual notation.
6. Show that for induction motor [ 5 ]  
 $T = \frac{2 T_m}{\frac{s}{s_M} + \frac{s}{s}}$   
The symbols have usual meaning.

**Group-C (Long Answer Type Question)***Answer any three of the following*

[ 15 x 3 = 45 ]

7. (a) Deduce an expression of the output voltage of a 3-phase full wave phase controlled converter. [ 7 ]  
Hence show how this converter can be used to control the speed of a dc shunt motor. Draw relevant diagrams.

- (b) A three-phase full converter is used to control the speed of a 220V, 3.73 KW, 1200 rpm, dc shunt motor. The ac supply is  $1.5\Omega$ . For  $\alpha = 60^\circ$ : the motor speed is 800 rpm. determine
- the average value of motor current. Assuming it to be ripple free.
  - The RMS value of the SCR current.
8. (a) Deduce the relationships necessary to obtain the heating & cooling curve of an electric motor [7]
- (b) A motor has a thermal heating time constant of 50 minutes. When the motor runs continuously on full load. its final temperature rise is  $80^\circ\text{C}$ . [8]
- what would be the temperature rise after 1 hour? if the motor runs continuously on full load?
  - How long will the motor take for its temperature to rise from  $50^\circ\text{C}$  to  $80^\circ\text{C}$ ? if it is working at its 1-hour rating.
9. (a) A 230V, 960 rpm, and 200 amp separately excited dc motor has an armature resistance of 0.02 ohm. The motor is fed from a chopper which provides both motoring and braking operations. The source has a voltage of 230V. Assuming continuous conduction [8]
- Calculate the duty ratio of the chopper for motoring operation at rated torque and 350 rpm.
  - Calculate the duty ratio of the chopper for braking operation at rated torque and 350 rpm
- (b) Explain the operation step up chopper drive with relevant diagram in DC motor drive. [7]
10. (a) advantages of electric vehicle (EV) over internal combustion Vehicle [5]
- (b) State the operation and characteristics curve of the solar power pump Drive. [5]
- (c) write short notes on solar power electric vehicles and boats. [5]
11. (a) Drive for textile mills [5]
- (b) V/f control of induction motor. [5]
- (c) Stepper motor [5]

\*\*\* END OF PAPER \*\*\*



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : OE-ME 701D Non-conventional Energy Sources

Time Allotted : 3 Hours

Full Marks :70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) What do you mean by Conventional energy?
- (II) What is the unit of solar constant?
- (III) what is the application of solar cell?
- (IV) What is diffuse radiation?
- (V) What are the advantage of solar thermal energy?
- (VI) What is wind energy?
- (VII) What is extraterrestrial radiation?
- (VIII) What are the main components of a flat plate collector?
- (IX) What is a solar collector?
- (X) Write down various types of solar energy collectors?
- (XI) What are the types of silicon solar cell?
- (XII) What is a zenith angle?

## Group-B (Short Answer Type Question)

Answer any three of the following

[ 5 x 3 = 15 ]

2. What are the limitation of solar cell? [ 5 ]
3. Write short note on Solar cooking? [ 5 ]
4. What are the most common applications for wind? [ 5 ]
5. What are the limitations of solar thermal energy? [ 5 ]
6. What are the limitations of obtaining energy from wind? [ 5 ]

## Group-C (Long Answer Type Question)

Answer any three of the following

[ 15 x 3 = 45 ]

7. Explain briefly the various non-conventional sources of energy. [ 15 ]
8. What is Solar Panel? Write its main three uses. [ 15 ]
9. What is solar energy ? How is the solar energy used to generate electricity in a solar power plant ? [ 15 ]
10. (a) What is Local Soar time? [ 5 ]  
(b) What is a zenith angle? [ 5 ]  
(c) What is azimuth angle? [ 5 ]
11. (a) What are the different types of solar collectors and how they work? [ 8 ]  
(b) Difference Between Flat Plate Solar Collector and Concentrating Type Solar Collector. [ 7 ]

\*\*\* END OF PAPER \*\*\*



*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words as far as practicable.*

**Group-A**

(Answer any ten questions)

1. Choose the correct alternatives from the following: **1×10=10**
- (i) For a P-pole machine relation between electrical and mechanical angle is given by
- (a)  $\theta_e = (2/p)\theta_m$  (b)  $\theta_e = (P)\theta_m$   
(c)  $\theta_e = (4/p)\theta_m$  (d)  $\theta_e = (p/2)\theta_m$
- (ii) DC Generator works on the principle of
- (a) Fleming left hand rule (b) Fleming right hand rule  
(c) Lenz's law (d) None of these
- (iii) The starting torque of a single phase IM is
- (a) uniform (b) high  
(c) low (d) zero
- (iv) In a synchronous motor, damper winding is provided in order to
- (a) stabilized rotor motion (b) suppress rotor oscillation  
(c) developed necessary starting torque (d) both (b) and (c)
- (v) The power factor of an alternator is determined by
- (a) speed (b) load  
(c) excitation (d) prime mover
- (vi) At lagging load, armature reaction in an alternator is
- (a) cross magnetizing (b) demagnetizing  
(c) non-effective (d) magnetizing
- (vii) The frequency of voltage generated by an alternator having 8 poles and rotating at 250 rpm is
- (a) 60Hz (b) 50Hz  
(c) 25Hz (d)  $16\frac{2}{3}$  Hz
- (viii) In which of the following, voltage regulation may be zero or negative?
- (a) unity pf (b) leading pf  
(c) lagging pf (d) All of these
- (ix) The pf of an alternator depends on
- (a) Load (b) Speed of rotor  
(c) Core losses (d) Armature losses
- (x) A commutator in a dc machine provides
- (a) half-wave rectification (b) full-wave rectification  
(c) half-wave controlled rectification (d) full-wave controlled rectification
- (xi) Capacitor start and run induction motor is basically
- (a) single phase induction motor (b) two phase induction motor  
(c) three phase induction motor (d) single phase reluctance motor
- (xii) The armature core of a dc machine is laminated to minimise
- (a) hysteresis loss (b) eddy-current loss  
(c) mechanical loss (d) temperature rise

### Group-B

Answer *any three* questions.

5×3=15

2. With diagram explain the operation of 3-point starter for a dc motor.
3. Why is a single phase induction motor not self-starting? Name the various methods of starting and mention which mode of starting will provide high starting as well as running torque.
4. Draw the torque-speed and torque-slip characteristics curve of 3 phase induction motor.
5. What are V-curves of a synchronous motor? What are the main characteristics of a synchronous motor?
6. Explain the process of building up of voltage in a d.c. shunt generator and give the conditions to be satisfied for voltage build-up.

### Group-C

Answer *any three* questions.

15×3=45

7. (a) A 75 kW, 400V, 4 pole, 3 phase, star connected synchronous motor has a resistance and synchronous reactance per phase of  $0.04\Omega$  and  $0.4\Omega$  respectively. Compute for full load  $0.8$ pf lead the open circuit emf per phase and gross mechanical power developed. Assume an efficiency of  $92.5\%$ .  
(b) A 6600V, 3 phase, star connected synchronous motor draws a full load current of 80A at  $0.8$ pf leading. The armature resistance is  $2.2\Omega$  and reactance of  $22\Omega$  per phase. If the stray losses of the machine are 3200W. Find,  
(i) Emf induced (ii) Output power (iii) Efficiency of the machine. 7+8=15
8. (a) An 18.65 kW, 4 pole, 50 Hz, 3 phase induction motor has friction and windage losses of  $2.5\%$  of the output. Full load slip is  $4\%$ . Find for full load,  
(i) rotor copper loss, (ii) rotor input (iii) shaft torque (iv) the gross electromagnetic torque.  
(b) The power input to the rotor of a 3 phase, 50 Hz, 6 pole induction motor is 80 kW. The rotor emf makes 100 complete alternations per minute. Find,  
(i) Slip (ii) Motor speed (iii) Mechanical power developed (iv) Rotor copper loss per phase (v) Rotor resistance per phase if rotor current is 65A (vi) Torque developed 8+7=15
9. A 100 kVA, 3000V, 50Hz, 3 phase star connected alternator has effective armature resistance of  $0.2$  ohm. The field current of 40A produces short-circuit current of 200A and an open circuit emf of 1040 V (line value). Calculate the full load voltage regulation at  $0.8$  pf lagging and  $0.8$  pf leading. Draw phasor diagram. 15
10. (a) What is armature reaction in a d.c. machine? Explain how the cross magnetising and demagnetising effects are produced.  
(b) What is hunting in an alternator? Explain how hunting can be minimized. 7+8=15
11. Write short notes on *any three* of the following: 5×3=15
  - (a) Explain the construction and working principle variable reluctance stepper motor.
  - (b) D.C. servo motor
  - (c) Brushless excitation of an alternator
  - (d) Rotating magnetic field of three-phase induction motor

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