

Time: 3 Hours

Max Marks: 70

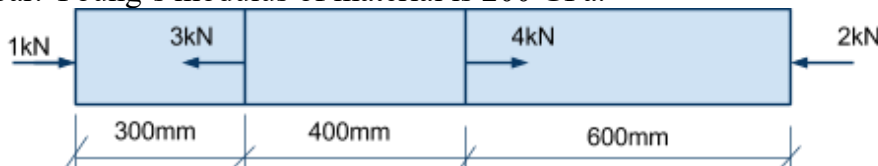
Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-I

- | | Marks | CO | BTL |
|--|-------|----|----------|
| 1. a) Define the terms. i) Working stress ii) Factor of safety
iii) Poisson's Ratio iv) Hooke's law | 7 M | 1 | Remember |
| b) A bar of uniform cross-sectional area 100 mm^2 is subjected to forces as shown below. Calculate the change in the length of the bar. Young's modulus of material is 200 GPa . | 7 M | 1 | Apply |



(OR)

- | | | | |
|---|-----|---|------------|
| 2. a) Formulate the relation between Modulus of Elasticity, Bulk Modulus and Poisson's Ratio of an elastic body. | 7 M | 1 | Understand |
| b) A compound tube consists of a steel tube 140 mm internal diameter and 160 mm external diameter and an out brass tube 160 mm internal diameter and 180 mm external diameter. The two tubes are of the same length. The compound tube carries an axial load of 900 kN . Find the stresses and the load carried by each tube and the amount if shortens. Length of each tube is 140 mm . Take E for Steel as $2 \times 10^5 \text{ N/mm}^2$ and for brass as $1 \times 10^5 \text{ N/mm}^2$. | 7 M | 1 | Apply |

UNIT-II

- | | | | |
|---|-----|---|-------|
| 3. a) A cantilever beam of span L is subjected to a point load 'w' at free end. Sketch the SFD and BMD of the beam indicating principal values. | 7 M | 2 | Apply |
| b) A simply supported beam of length 8 m , carries point loads of 4 kN and 7 kN at distances 3 m and 6 m from the left end. Construct SFD and BMD for the beam. | 7 M | 2 | Apply |

(OR)

- | | | | |
|--|-----|---|-------|
| 4. a) A cantilever beam of span L is subjected to an U.D.L 'w' per meter over the entire span. Sketch the SFD and BMD of the beam indicating principal values. | 7 M | 2 | Apply |
| b) A simply supported beam of length 8 m rests on supports 6 m apart, the right hand end is overhanging by 2 m . The beam carries a uniformly distributed load of 1.5 kN/m over the entire length. Construct the SFD and BMD of the beam by indicating point of contraflexure. | 7 M | 2 | Apply |

UNIT-III

- | | | | |
|--|-----|---|------------|
| 5. a) Derive pure bending equation. | 7 M | 3 | Understand |
| b) A beam is simply supported and carries a uniformly distributed load of 40 kN/m run over the whole span. The section of the beam is rectangular having depth as 500 mm . If the Maximum stress in the material of the beam is 120 N/mm^2 and moment of inertia of the section is $7 \times 10^8 \text{ mm}^4$, find the span of the beam. | 7 M | 3 | Apply |

(OR)

- | | | | | | |
|----|----|---|-----|---|-------|
| 6. | a) | Calculate section modulus for i) Rectangular section ii) Circular Section iii) Hollow circular | 7 M | 3 | Apply |
| | b) | A beam of circular section of 100 mm diameter is subjected to a shear force of 5 kN. Calculate i) average shear stress ii) maximum shear stress. Also sketch the variation of shear stress along the depth of the beam. | 7 M | 3 | Apply |

UNIT-IV

- | | | | | | |
|----|----|---|-----|---|------------|
| 7. | a) | Derive the torsion equation. | 7 M | 4 | Understand |
| | b) | Find the maximum torque that can be safely applied to a shaft of 200 mm diameter if the permissible angle of twist is 10 in a length of 5 m and the permissible shear stress is 45 N/mm ² . Take $N = 0.8 \times 10^5$ N/mm ² . | 7 M | 4 | Apply |

(OR)

- | | | | | | |
|----|----|--|-----|---|-------|
| 8. | a) | Mutually perpendicular forces of a square element of thin plate are subjected to normal and shear stresses 65 N/mm ² (tensile), 47.20 N/mm ² (compressive) and 39.40 N/mm ² (Shear). Determine the magnitude of principle stresses and its direction. Determine the maximum shear stress and its direction. | 7 M | 4 | Apply |
| | b) | At a point in a strained material the principal stresses are 100 N/mm ² (tensile) and 60 N/mm ² (compressive). Determine the normal stress, shear stress and resultant stress on a plane inclined at 50° to the axis of major principal stress. Also determine the maximum shear stress at the point. | 7 M | 4 | Apply |

UNIT-V

- | | | | | | |
|----|----|---|-----|---|------------|
| 9. | a) | A column of timber section 300 mm x 450 mm is 7 m long both ends being fixed. E for timber is 18.5 kN/mm ² , Determine
a) Crippling load
b) Safe load for the column if factor of safety = 3 | 7 M | 5 | Understand |
| | b) | Derive the expression for Euler's crippling load for a column When both ends are hinged. | 7 M | 5 | Apply |

(OR)

- | | | | | | |
|-----|----|--|-----|---|-------|
| 10. | a) | Derive secant formula for the maximum stress developed in a eccentrically loaded column. | 7 M | 5 | Apply |
| | b) | Calculate the maximum value of slenderness ratio of a mild steel column for which Euler's formula is valid. $\sigma_c = 330$ N/mm ² and $E = 210$ GN/m ² . | 7 M | 5 | Apply |

Time: 3 Hours

Max Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-I

- | | | Marks | CO | BTL |
|----|---|-------|----|-----|
| 1. | a) Convert the following binary number to their equivalent decimal and hexadecimal (base 16) representation.
i) 101101.0101 ii) 1010.0111 iii) 10.01 | 7 | 1 | L3 |
| | b) Subtract the following using 1's and 2's complement (101)2 - (10110)2. | 7 | 1 | L2 |

(OR)

- | | | | | |
|----|---|---|---|----|
| 2. | a) i) Convert Binary 1011 to Gray Code.
ii) Convert Gray Code 1110 to Binary | 7 | 1 | L3 |
| | b) Explain the concept of BCD with an example. | 7 | 1 | L2 |

UNIT-II

- | | | | | |
|----|---|---|---|----|
| 3. | a) Explain the basic logic gates (AND, OR, NOT, NAND, NOR, XOR, XNOR) with their Boolean expressions and truth tables. Provide real-world applications of each. | 7 | 2 | L2 |
| | b) Design and explain the working of a Half Adder circuit. Derive its Boolean expression and construct the truth table. | 7 | 2 | L4 |

(OR)

- | | | | | |
|----|--|---|---|----|
| 4. | a) Using Boolean algebra, simplify the following expressions:
a) $AB + A\bar{B}$
b) $(A + B)(A + \bar{B})$ | 7 | 2 | L3 |
| | b) Minimize the following Boolean function using a 4-variable Karnaugh map:
$F(A,B,C,D) = \sum m(0,2,3,5,7,8,10,13,15)$ | 7 | 2 | L2 |

UNIT-III

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|----|---|---|---|----|
| 5. | a) Describe the structure and main components of the Central Processing Unit (CPU). Explain the roles of the Arithmetic Logic Unit (ALU), Control Unit (CU), and registers in CPU operations. | 7 | 3 | L3 |
| | b) Explain the different types of memory in a computer system (RAM, ROM, Cache, Register, and Secondary Memory). How do they differ in terms of speed, size, and functionality? | 7 | 3 | L2 |

(OR)

- | | | | | |
|----|---|---|---|----|
| 6. | a) What is RTL (Register Transfer Level)? Explain how computer instructions are interpreted using RTL notations with examples (e.g., Load, Add, Store). | 7 | 3 | L2 |
| | b) What are addressing modes? List and explain different types of addressing modes with examples | 7 | 3 | L2 |

UNIT-IV

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|----|--|---|---|----|
| 7. | a) Explain the concept of memory hierarchy in computer systems. Why is it essential, and how does it improve system performance? Illustrate with a diagram showing all levels. | 7 | 4 | L2 |
| | b) What is an Input-Output interface? Explain the function of I/O interfaces in facilitating communication between CPU and peripheral devices. | 7 | 4 | L2 |

(OR)

- | | | | | |
|----|--|---|---|----|
| 8. | a) Describe the internal organization and working of RAM chips. What is the difference between Static RAM (SRAM) and Dynamic RAM (DRAM)? | 7 | 4 | L2 |
| | b) Compare Isolated I/O and Memory-Mapped I/O. Explain how addressing and control signals are managed in each method. | 7 | 4 | L3 |

UNIT-V

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|----|---|---|---|----|
| 9. | a) Explain the concept of pipelining in CPU architecture. How does pipelining improve the overall performance of a processor? Use diagrams to illustrate the concept. | 7 | 5 | L2 |
| | b) What is an interconnection network in multiprocessor systems? Describe various interconnection topologies such as bus, crossbar, and mesh. | 7 | 5 | L2 |

(OR)

- | | | | | |
|-----|--|---|---|----|
| 10. | a) What are pipeline hazards? Classify and explain the different types of hazards encountered in pipelined processors with examples: | 7 | 5 | L3 |
| | b) Explain the cache coherency problem with an example involving multiple processors accessing shared memory. | 7 | 5 | L2 |

**ANALOG ELECTRONIC CIRCUITS
(Electronics and Communication Engineering)****Time: 3 Hours****Max Marks: 70**

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

		Marks	CO	Blooms Level
<u>UNIT-I</u>				
1.	a) Discuss the general characteristics of negative feedback amplifier	7	1	L2
	b) Draw and explain the block diagram of voltage shunt feedback amplifiers	7	1	L2
(OR)				
2.	a) Draw and explain the block diagram of voltage series feedback amplifiers	7	1	L2
	b) Discuss the operation of Colpitts Oscillator	7	1	L1
<u>UNIT-II</u>				
3.	a) Discuss the operation of Darlington pair	7	2	L2
	b) Describe the operation of CS amplifiers	7	2	L2
(OR)				
4.	a) Analyses the two stage RC coupled amplifiers	10	2	L4
	b) Discuss about different types of coupling	4	2	L2
<u>UNIT-III</u>				
5.	a) Discuss the operation of class A power amplifier. Derive the efficiency of a class A power amplifier	7	3	L3
	b) Briefly explain about stagger tuned amplifier.	7	3	L2
(OR)				
6.	a) Discuss the operation of class AB power amplifiers	7	3	L3
	b) Briefly explain about double tuned amplifier	7	3	L2
<u>UNIT-IV</u>				
7.	a) Write about switching times of a transistor	7	4	L2
	b) Discuss the operation of Astble multi vibrator as free running oscillator	7	4	L4
(OR)				
8.	a) Describe the operation of bi-stable multi vibrator	7	4	L3
	b) What is the need for Schmitt trigger and explain its operation briefly	7	4	L2
<u>UNIT-V</u>				
9.	a) Discuss the general features of time based signal	5	5	L2
	b) Ddiscuss about Millers Time Base generator with a neat sketch	9	5	L3
(OR)				
10.	a) Ddiscuss about Boots strap Time Base generator with a neat sketch	10	5	L3
	b) What is the purpose of linearity improvement	4	5	L4

ELECTRIC CIRCUIT THEORY
(Electrical and Electronics Engineering)**Time: 3 Hours****Max Marks: 70**

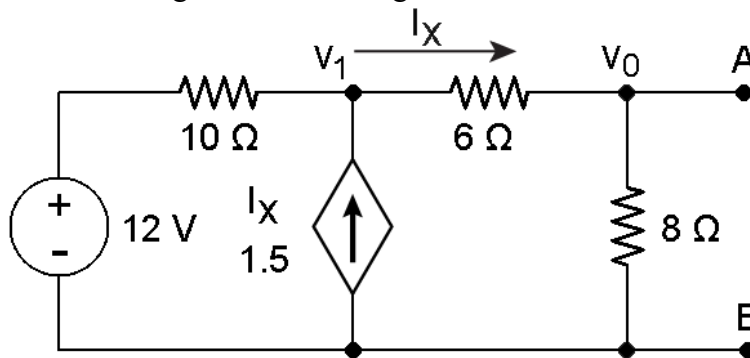
Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-I

1. a) Calculate the voltage across
- ab
- using Thevenin's theorem



Marks	CO	Blooms Level
7	1	L4

- b) Explain Reciprocity theorem with AC excitation
-
- (OR)

7	1	L2
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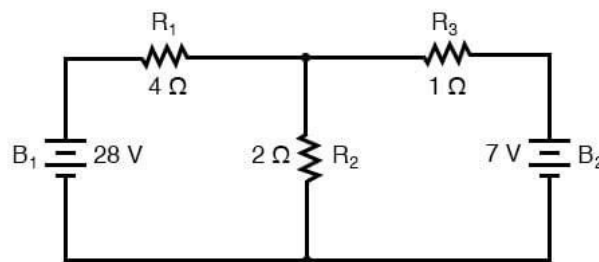
2. Explain the Thevenin's and Norton's theorem with an example in detail

14	1	L4
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UNIT-II

3. a) Derive the condition to obtain Maximum power transfer in a circuit with DC excitation
-
- b) Calculate current through
- 2Ω
- resistance using Millman's theorem

6	2	L2
8	2	L4



(OR)

4. a) Explain Compensation theorem with DC excitation.
-
- b) Derive the condition for resonance in parallel resonance circuit

7	2	L3
7	2	L3

UNIT-III

5. a) Derive the relation between line and phase voltages and currents in three phase balanced star connected system.

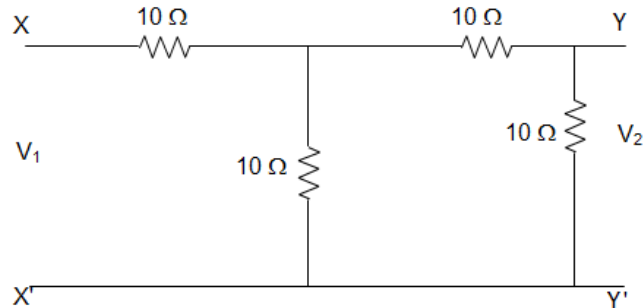
14	3	L2
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(OR)

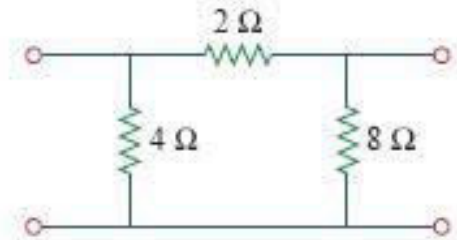
6. a) Two wattmeters connected to a 3-phase motor indicate the total power input to be 1000W. The power factor is 0.86. Determine the readings of each wattmeter. 7 3 L3
- b) A balanced abc-sequence Y-connected source is connected to a Δ -connected balanced load $(8 + j4) \Omega$ per phase. Calculate the phase and line voltages and currents. 7 3 L4

UNIT-IV

7. a) Calculate the hybrid parameters for the network shown 8 4 L3



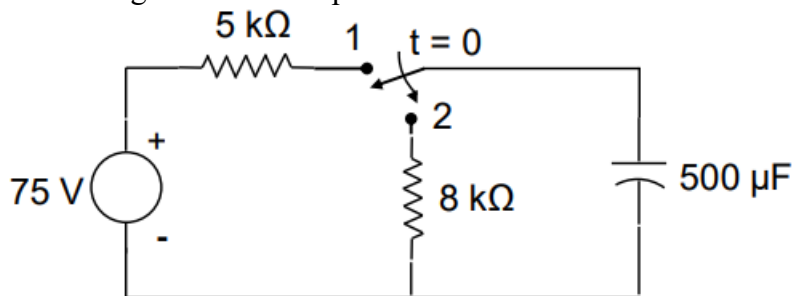
- b) Derive the condition for reciprocity and symmetry in Y-parameters (OR) 6 4 L2
8. a) Find the Z-parameters of the two-port network shown 7 4 L4



- b) Express transmission parameters in terms of admittance parameters 7 4 L2

UNIT-V

9. The switch in circuit shown was in position 1 for a long time. It is moved from position 1 to position 2 at time $t = 0$. Determine and sketch the voltage across the capacitor 14 5 L4



(OR)

10. Derive the voltage expression for a RC- circuit with DC excitation when the switch is on at $t = 0$. 14 5 L2

**DATABASE MANAGEMENT SYSTEM
(Common TO CSE (AIML), CSE(DS) & IT Branches)****Time: 3 Hours****Max Marks: 70**

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

		Marks	CO	Blooms Level
<u>UNIT-I</u>				
1.	a) Explain how database systems overcome the limitations of traditional file systems with suitable examples.	7	CO1	L2
	b) How data models are important in database management system? discuss various data models	7	CO1	L3
(OR)				
2.	a) Analyze the differences between file systems and database systems in terms of data integrity, concurrency, and security.	7	CO1	L4
	b) Discuss in brief about DDL and DML commands.	7	CO1	L2
<u>UNIT-II</u>				
3.	a) Explain the structure of a relational database with an example.	7	CO2	L3
	b) Analyze the role of GROUP BY and HAVING clauses in comparison with WHERE clause filtering.	7	CO2	L4
(OR)				
4.	a) Apply the concept of <i>keys</i> (primary, candidate, foreign) to a “Student–Course–Enrollment” database and illustrate their roles.	7	CO2	L3
	b) Analyze the consequences of violating referential integrity in a relational database system.	7	CO2	L4
<u>UNIT-III</u>				
5.	a) Explain GRANT and REVOKE commands with examples.	7	CO3	L2
	b) Describe the key components of the E-R model with an example.	7	CO3	L2
(OR)				
6.	a) Apply the design process to outline the stages of creating a database for an online bookstore.	7	CO3	L3
	b) Differentiate between INNER JOIN, LEFT JOIN, and RIGHT JOIN with examples.	7	CO3	L3
<u>UNIT-IV</u>				
7.	a) Illustrate insertion, deletion, and update anomalies using a Student–Course table.	7	CO4	L2
	b) Compare dependency-preserving and non-preserving decompositions with respect to query efficiency.	7	CO4	L2
(OR)				
8.	a) Differentiate between 1NF, 2NF, and 3NF with examples.	7	CO4	L2
	b) Analyze the role of functional dependencies in schema refinement.	7	CO4	L3
<u>UNIT-V</u>				
9.	a) Explain the ACID properties of transactions with suitable examples.	7	CO5	L3
	b) Apply lock granting rules to illustrate how two transactions compete for the same resource.	7	CO5	L4
(OR)				
10.	a) Define serializability and explain its significance.	7	CO5	L2
	b) Describe hash-based and tree-based index structures.	7	CO5	L3

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-I

- | | | Marks | CO | BTL |
|----|--|-------|----|-----|
| 1. | a) Explain with a neat sketch the stress-strain diagram for a mild steel specimen subjected to tensile force and indicate salient points. | 7 | 1 | 2 |
| | b) A round copper rod, 560 mm long, has a diameter of 30 mm over a length 200 mm, a diameter of 20 mm over a length 200 mm and a diameter of 10mm over its remaining length. Determine the stress in each section and elongation of the rod when it is subjected to an axial pull of 30000N. Take $E=1 \times 10^5 \text{ N/mm}^2$. | 7 | 1 | 3 |

(OR)

- | | | | | |
|----|--|---|---|---|
| 2. | a) A steel rod of 20 mm diameter and 200 mm length is subjected to a 20 kN tensile force. The extension is found to be 0.53 mm and the decrease in diameter is equal to 0.0022 mm. Determine i) Young's modulus of elasticity, ii) Tensile Stress, iii) Tensile Strain iv) Poisson's ratio. | 6 | 1 | 3 |
| | b) A reinforced concrete column 500 mm X 500 mm in section is reinforced with 4 steel bars of 25 mm diameter, one in each corner. The column is carrying a load of 1000 kN. Find the stresses in the concrete and steel bars. Take E for steel = $2.1 \times 10^5 \text{ N/mm}^2$ and E for concrete = $14 \times 10^3 \text{ N/mm}^2$. | 8 | 1 | 3 |

UNIT-II

- | | | | | |
|----|---|---|---|---|
| 3. | a) Define a beam and explain the different types of beams with neat sketches. | 5 | 2 | 2 |
| | b) A cantilever beam of length 3m carries a point load of 5 kN at the free end and a UDL of 2 kN/m over its entire length. Draw SF and BM diagrams. | 9 | 2 | 3 |

(OR)

- | | | | | |
|----|---|----|---|---|
| 4. | A simply supported beam of 6m long carries a uniformly distributed load 5 kN/m over entire length and a point load of 10kN at its centre. Draw the Shear force and bending moment diagrams. | 14 | 2 | 3 |
|----|---|----|---|---|

UNIT-III

5. a) Starting from fundamentals, derive simple bending equation. 7 3 2
- $$\frac{\sigma}{y} = \frac{M}{I} = \frac{E}{R}$$
- 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 maximum allowable shear stress as 70 N/mm². 7 3 3

(OR)

6. A T section of a beam has the following dimensions. Flange 100 mm X 10 mm and Web 70 mm X 10 mm. Determine the maximum bending stress in the beam, when a bending moment of 200 N-m is acting on the section. 14 3 3

UNIT-IV

7. a) Derive the equations for slope and deflection of a cantilever beam subjected to concentrated load at the free end using double integration method. 7 4 2
- b) A cantilever of length 3 m carries a UDL of 15 kN/m over its entire length. If $I = 1 \times 10^8 \text{ mm}^4$ and $E = 2 \times 10^5 \text{ N/mm}^2$, Find i) Slope at the free end and ii) Deflection at the free end. 7 4 3

(OR)

8. A simply supported beam of span $L = 6 \text{ m}$ carries a uniformly distributed load $w = 5 \text{ kN/m}$ over the entire span. The flexural rigidity of the beam is $EI = 2.5 \times 10^7 \text{ N-mm}^2$. Determine i) The slope at the left support and ii) The maximum deflection. 14 4 3

UNIT-V

9. a) Derive the formula for Euler's critical load for a column with both ends hinged. 7 5 2
- b) A T-section having flange 150mm X 20mm and web 100 mm × 20 mm is used as a column of 4 m long hinged at both ends. Calculate the crippling load, if Young's modulus for the material of the section is $2 \times 10^5 \text{ N/mm}^2$. 7 5 3

(OR)

10. a) Derive the expression for the Euler crippling or buckling load when both the ends of the column are fixed and also state the assumptions in the derivation. 7 5 2
- b) A solid round bar 3 m long and 50 mm in diameter is used as a column with both ends hinged. Determine the percentage change in the Euler's critical load of the column if the end conditions are changed to both ends fixed. Take $E = 2 \times 10^5 \text{ N/mm}^2$ 7 5 3

**Electronic Devices and Circuits
(Electrical and Electronics Engineering)****Time: 3 Hours****Max Marks: 60**

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-I

1. a) Explain about the operation of a PN Junction diode in Forward Bias condition with help of V-I Characteristic graph 6
- b) Briefly explain Diode working as a switch 6

(OR)

2. a) Explain Zener diode operation with help of V-I characteristics. 6
- b) Explain how a Zener diode works as a voltage regulator? 6

UNIT-II

3. a) Derive the expression for ripple factor of a full wave rectifier. 6
- b) Explain the operation of a halfwave rectifier with help of a figure. 6

(OR)

4. a) Derive the expression for ripple factor of a half wave rectifier with L-section filter. 6
- b) Mention the advantages of full wave rectifier over Half Wave rectifier. 6

UNIT-III

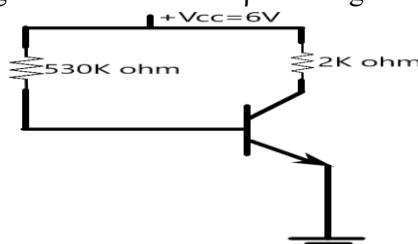
5. a) Explain principle of the operation of UJT with the help of its V-I characteristics. 6
- b) Explain the operation of N- channel JFET 6

(OR)

6. a) Explain the input and output characteristics of transistor in common base configuration. 6
- b) Explain about N-channel Depletion Mode MOSFET 6

UNIT-IV

7. a) Determine the operating point and draw the DC load line for the fixed biasing circuit shown in the figure. Given that the β of the germanium transistor used for the biasing is 150. 6



- b) Explain Thermal run away and thermal stability 6

(OR)

8. a) Derive Stabilisation factor S and mention the value of S for fixed bias 6
- b) Derive Stabilisation factor S^1 and mention the value of S^1 for fixed bias 6

UNIT-V

9. a) Explain how a transistor works as an amplifier. 6
- b) Explain the working of Hartley oscillator with suitable figure 6

(OR)

10. a) Explain CE amplifier with suitable diagram. 6
- b) Explain the working of Collpitt's oscillator with suitable figure 6

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-I

1. a) What are the modes of measuring pressure? 6
b) Define viscosity? what are the types of viscosity? Write units of viscosity? 6
(OR)
2. a) What is meta-centric height? Derive an equation for meta-centric height? 6
b) A metallic body floats at the interface of mercury of sp.gr.13.6 and water in such away that 30% of its volume is sub-merged in mercury and 70% in water. Find the density of the body. 6

UNIT-II

3. a) Define path line, stream line, Velocity potential function, stream function, 6
b) An open circular cylinder of 20cm diameter and 100 cm long contains water up to a height of 80cm. It is rotated about its vertical axis. Find the speed of rotation when
i) No water spills ii) axial depth is zero 6
(OR)
4. a) State the assumptions and derive Bernoulli's equation 6
b) The water is flowing through a pipe having diameters 20cm and 15cm at sections 1 and 2 respectively, the rate of flow through pipe is 40 lit/sec. The section 1 is 6m above the datum line and section 2 is 3m above the datum. If the pressure at section 1 is 29.43 N/cm², find the intensity of pressure at section 2. 6

UNIT-III

5. a) Explain different types of frictional losses in pipes? Derive Darcy Weisbach equation for frictional losses in pipes? 6
b) Explain briefly minor losses of a closed conduit flow in a pipe. 6
(OR)
6. a) Define the terms: (i) Impact of jets on a flat plate, and (ii) Impact of jets on a curved plate (Both are stationary). 6
b) A jet of water of 2.5 cm diameter, moving with a velocity of 10 m/s, strikes a hinged square plate of weight 98.1 N at the centre of the plate. The plate is of uniform thickness. Find the angle through which the plate will swing. 6

UNIT-IV

7. a) What is a draft tube? Why is it used in a reaction turbine? Describe with neat sketch two different types of draft tubes 6
b) A Francis turbine working under a head of 5 m at a speed of 210 rpm develops 75 KW when the rate of flow of water is 1.8 m³/ sec. If the head is increased to 16 m, determine the speed, discharge and power. 6

(OR)

8. a) How will you classify the turbines? 6
b) Obtain an expression for the work done per second by water on the runner of a Pelton wheel. Hence derive an expression for maximum efficiency of the Pelton wheel giving the relationship between the jet speed and bucket speed. Also draw inlet and outlet velocity triangles for a Pelton turbine and indicate the direction of various velocities. 6

UNIT-V

9. a) State the advantages of a centrifugal pump over a displacement (reciprocating) pump 6
b) A centrifugal pump delivers water against a net head of 14.5 meters and a design speed of 1000 rpm. The vanes are curved back to an angle of 30° 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%. 6

(OR)

10. a) Describe principle and working of a reciprocating pump. 6
b) A single-acting reciprocating pump, running at 50 rpm, delivers $0.01 \text{ m}^3/\text{s}$ of water. The diameter of the piston is 200 mm and stroke length 400 mm. Determine 6

- i. The theoretical discharge of the pump.
- ii. Co-efficient of discharge,
- iii. Slip and the percentage of slip of the pump

2 of 2

Time: 3 Hours

Max Marks: 60

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

		Marks	CO	BTL
UNIT-I				
1.	a) Apply the concept of Register Transfer Language (RTL) to represent and interpret data movement and arithmetic operations.	5	1	K3
	b) Discuss how the control unit decodes instructions into micro-operations.	5	1	K2
(OR)				
2.	a) Construct a flow diagram to demonstrate the instruction cycle of a CPU.	5	1	K3
	b) Illustrate the difference between direct and indirect addressing modes with examples	5	1	K2
UNIT-II				
3.	a) Show how a carry look-ahead adder computes carries faster than a ripple carry adder for a 4-bit input.	5	2	K3
	b) Describe the difference between fixed-point and floating-point representations with examples.	5	2	K2
(OR)				
4.	a) Using Booth's algorithm, multiply $(-5 \times +3)$ in 5-bit 2's complement form.	5	2	K3
	b) Compare restoring and non-restoring division techniques.	5	2	K2
UNIT-III				
5.	a) Demonstrate with an example how cache hit and cache miss influence CPU access time.	6	3	K3
	b) Describe the characteristics of main memory and its role in system performance.	4	3	K2
(OR)				
6.	a) Demonstrate how an associative memory compares a search key with stored words using match logic.	6	3	K3
	b) Describe the concept of page table and its function in virtual memory management.	4	3	K2
UNIT-IV				
7.	a) Demonstrate with a diagram how I/O interface modules connect peripheral devices to the CPU through system buses.	6	4	K3
	b) Discuss the concept of priority interrupt and why it is necessary in multiprogramming environments.	4	4	K2
(OR)				
8.	a) Demonstrate the step-by-step process of asynchronous data transfer using a timing diagram.	6	4	K3
	b) Discuss the difference between isolated I/O and memory-mapped I/O systems.	4	4	K2
UNIT-V				
9.	a) Demonstrate with a suitable example how vector processing executes large data sets in parallel to enhance computational performance.	6	5	K3
	b) Discuss the concept of parallel processing and how it enhances computer performance.	4	5	K2
(OR)				
10.	a) Demonstrate with a diagram the working principle of an array processor and explain how it differs from scalar and vector processors.	6	5	K3
	b) Describe the differences between arithmetic pipeline and instruction pipeline.	4	5	K2
UNIT-VI				
11.	Demonstrate the communication and synchronization mechanisms between processors in a shared-memory system using semaphores or message passing.	10	6	K3
(OR)				
12.	Demonstrate with an example how cache coherence mechanisms maintain data consistency and improve performance in multiprocessor systems.	10	6	K3

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-I

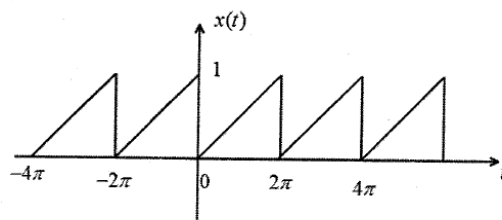
- | | Marks | CO | BTL |
|---|-------|-----|-----|
| 1. a) Check whether the following system is (i) linear or not (ii) Causal or not (iii) Time invariant or not $y(n)=x[n] + x[n-1]$ | 5 | CO1 | K3 |
| b) Explain the following signals: a) Unit Step b) Unit Impulse c) Real Exponential | 5 | CO1 | K2 |

(OR)

- | | | | |
|--|---|-----|----|
| 2. a) Prove that $\cos n\omega_0 t$ and $\cos m\omega_0 t$ are orthogonal to each other for all integers m, n. | 5 | CO1 | K3 |
| b) Define mean square error and solve the equation for evaluating mean square error. | 5 | CO1 | K2 |

UNIT-II

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|---|--|--|----|
| 3. a) Determine the Exponential Fourier series of the signal. | | | K3 |
|---|--|--|----|



- | | | | |
|--|---|-----|----|
| b) Discuss the concepts of Trigonometric Fourier series and derive the expression for Trigonometric Fourier coefficients | 5 | CO2 | K2 |
|--|---|-----|----|
- (OR)**
- | | | | |
|---|---|-----|----|
| 4. a) Determine the Fourier transform of the following functions.
i) Unit step function ii) Unit impulse function. | 5 | CO2 | K2 |
| b) Find the Fourier transform of the Rectangular pulse $x(t)$ | 5 | CO2 | K3 |

UNIT-III

- | | | | |
|--|---|-----|----|
| 5. a) Explain ideal filter characteristics of linear systems | 5 | CO3 | K2 |
| b) Define Signal bandwidth and System bandwidth. | 5 | CO3 | K1 |

(OR)

6. a) Explain the concept of Distortionless Transmission of a system in detail 5 CO3 K3
 b) A stable LTI system is characterized by the differential equation
- $$\frac{d^2y(t)}{dt^2} + 4 \frac{dy(t)}{dt} + 3y(t) = \frac{dx(t)}{dt} + 2x(t)$$
- CO3 K3
- Find the output response of the system for the input signal $x(t) = e^{-t} u(t)$

UNIT-IV

7. a) Using the Time domain approach, find the convolution of the signals 5 CO4 K3
 $x_1(t) = e^{-2t} u(t)$ and $x_2(t) = e^{-4t} u(t)$
 b) Discuss the autocorrelation and cross-correlation 5 CO4 K2
 (OR)
8. a) State and prove the relation between autocorrelation function and the energy/power spectral density function 5 CO4 K2
 b) State all properties of convolution. 5 CO4 K2

UNIT-V

9. a) Find the inverse Laplace transform of the following 5 CO5 K3

$$X(s) = \frac{s}{s^2 + 5s + 6}$$

 b) State and prove the Time Differentiation and Convolution Property in the Laplace Transform. 5 CO5 K2
 (OR)
10. a) Find the Laplace Transform of the following equation and obtain ROC 5 CO5 K3
 $x(t) = e^{-a|t|} u(t)$
 b) State the properties of the ROC of Laplace Transform. 5 CO5 K2

UNIT-VI

11. a) State and prove the sampling theorem for band-limited signals. 5 CO6 K2
 b) A signal $x(t) = 2 \cos 400 \pi t + 6 \cos 640 \pi t$ is ideally sampled at $f_s = 500\text{Hz}$. If the sampled signal is passed through an ideal low-pass filter with a cut-off frequency of 400 Hz, what frequency components will appear in the output? 5 CO6 K3
 (OR)
12. a) By using long division, determine the inverse Z-transform of 5 CO6 K3

$$X(z) = \frac{1 + 2Z^{-1}}{1 - 2Z^{-1} + Z^{-2}}$$

 b) State and prove any three properties of Z-Transform 5 CO6 K2

**ELECTRICAL MEASUREMENTS
(Electrical and Electronics Engineering)****Time: 3 Hours****Max Marks: 60**

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

		Marks	CO	BTL
<u>UNIT-I</u>				
1.	a) With neat sketches, explain the working of PMMC instruments	5	CO1	L2
	b) Explain the construction and working of moving iron type instruments	5	CO1	L2
(OR)				
2.	a) Describe the function and types of damping used in indicating instruments	5	CO1	L1
	b) Explain how a voltmeter range can be extended using series resistance.	5	CO1	L3
<u>UNIT-II</u>				
3.	a) Explain the construction and working of a single-phase dynamometer wattmeter	5	CO2	L2
	b) Write the difference CT and PT? How compensate their errors?	5	CO2	L4
(OR)				
4.	a) Draw and explain the working of a Hall effect device used for current measurement.	5	CO2	L3
	b) Explain the procedure to measure power using instrument transformers ?	5	CO2	L3
<u>UNIT-III</u>				
5.	a) What is creeping in an energy meter? How is it prevented?	5	CO3	L2
	b) What is a trivector meter? Explain how it records kW, kVAR, and kVAh simultaneously.	5	CO3	L4
(OR)				
6.	a) Explain the construction and working of a dynamometer type P.F. meter.	5	CO3	L2
	b) Discuss the design considerations for accurate measurement of power factor.	5	CO3	L5
<u>UNIT-IV</u>				
7.	a) Explain the construction and working of Kelvin's double bridge for the measurement of low resistance.	5	CO4	L2
	b) What are the sources of error in low resistance measurement? How are they minimized?	5	CO4	L4
(OR)				
8.	a) Explain the working of Hay's bridge and state its advantages over Maxwell's bridge.	5	CO4	L4
	b) Derive the condition for balance in a Wheatstone bridge.	5	CO4	L3
<u>UNIT-V</u>				
9.	a) Derive the equation of motion of a ballistic galvanometer.	5	CO5	L3
	b) Compare a flux meter with a ballistic galvanometer.	5	CO5	L4
(OR)				
10.	a) Describe the construction and operation of Crompton's potentiometer.	5	CO5	L2
	b) Explain the AC Potentiometer method for measurement of iron losses in ferromagnetic materials	5	CO5	L3
<u>UNIT-VI</u>				
11.	a) Explain the working principle of a piezoelectric transducer and its applications.	5	CO6	L3
	b) Describe the principle of operation of a digital multimeter (DMM).	5	CO6	L2
(OR)				
12.	a) Explain the principle of LVDT with neat diagram.	5	CO6	L2
	b) What are the advantages and limitations of thermocouples and thermistors?	5	CO6	L5

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)**

II B.Tech I Semester Supplementary Examinations, November-2025

**FLUID MECHANICS
(Mechanical Engineering)**

Time: 3 Hours

Max Marks: 60

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

<u>UNIT-I</u>		Marks	CO	Blooms Level
1.	a) Derive expression for height of capillary rise.	5	1	Understanding
	b) Calculate the capillary rise/fall in a glass tube of 2.5 mm in diameter when immersed in water and mercury. Take surface tension of water as 0.0725 N/m and for mercury is 0.52 N/m. The specific gravity of mercury is 13.6 and angle of contact is 130° .	5	1	Apply
(OR)				
2.	a) Calculate the dynamic viscosity of oil, which is used for lubrication between a square plate of size 0.8 m X 0.8 m and an inclined plane with an angle of lubrication 30° . The weight of the square plate is 300 N and it slides down the inclined plane with a uniform velocity of 0.3 m/s. The thickness of film is 1.5 mm.	5	1	Apply
	b) Distinguish between dynamic and kinematic viscosity.	5	1	Understanding
<u>UNIT-II</u>				
3.	a) Determine the total pressure on a circular plate of diameter 1.5 m which is placed vertically in water in such a way that the centre of the plate is 3 m below the free surface of water.	5	2	Apply
	b) Briefly explain the term centre of buoyancy.	5	2	Understanding
(OR)				
4.	a) A wooden block of specific gravity 0.75 floats in water. If the size of block is 1m x 0.5m x 0.4m, find its meta centric height.	5	2	Apply
	b) A solid cylinder of diameter 4.0 m has a height of 3m. Find the meta – centric height of the cylinder when it is floating in water with its axis vertical. The sp gr of the cylinder is 0.60.	5	2	Apply
<u>UNIT-III</u>				
5.	a) Derive the continuity equation for a three-dimensional incompressible flow.	5	3	Understanding
	b) The stream function for a dimensional flow is given by $\Psi = 2xy$. Calculate the resultant velocity at P(3,4). Also, the velocity potential function ϕ .	5	3	Apply

(OR)

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|----|--|----|---|-------|
| 6. | An oil of sp .Gr. 0.8 is flowing through a venturi meter having an inlet diameter 20 cm and throat diameter 10 cm. The oil mercury differential manometer shows a reading of 25 cm. Examine the discharge of oil through the horizontal venturi meter, Take $C_D = 0.98$. | 10 | 3 | Apply |
|----|--|----|---|-------|

UNIT-IV

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|----|--|---|---|---------------|
| 7. | a) The rate of flow of water through a horizontal pipe is 0.25 m ³ /s. The diameter of the pipe which is 200 mm is suddenly enlarged to 400 mm. The pressure intensity in the smaller is 11.772 N/cm ² . Identify the (i) loss of head due to sudden enlargement, (ii) pressure intensity in the large pipe. | 5 | 4 | Apply |
| | b) How will you determine the velocity at any point with the help of pitot-tube? | 5 | 4 | Understanding |

(OR)

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|----|--|---|---|---------------|
| 8. | a) A horizontal venturi meter with inlet diameter and throat diameters, 20 cm and 10cm is used to measure the flow of water. The pressure at inlet is 17.658 N/cm ² and the vacuum pressure at the throat is 30 cm of mercury. Find the discharge of water through venturi meter. Take $C_d = 0.98$. | 5 | 4 | Apply |
| | b) Derive an expression to determine rate of flow through orifice meter. | 5 | 4 | Understanding |

UNIT-V

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|----|---|----|---|---------------|
| 9. | State and explain about the Buckingham's pi-theorem | 10 | 5 | Understanding |
|----|---|----|---|---------------|
- (OR)
- | | | | | |
|-----|---|----|---|-------|
| 10. | The efficiency of the fan depends on the density (ρ) dynamic viscosity (μ) angular viscosity (ω), diameter (D), Discharge (Q). Express efficiency in terms of dimensionless parameters using Rayleigh's method. | 10 | 5 | Apply |
|-----|---|----|---|-------|

UNIT-VI

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|-----|---|----|---|-------|
| 11. | A plate of length 750 mm and width 250 mm has been placed longitudinally in a stream of crude oil which flows with a velocity of 5 m/s. If the crude oil has a specific gravity of 0.8 and kinematic viscosity of 1 stoke, Estimate: i) Boundary layer thickness at the middle of the plate. ii) Shear stress at the middle of the plate. | 10 | 6 | Apply |
|-----|---|----|---|-------|
- (OR)
- | | | | | |
|-----|--|----|---|---------------|
| 12. | Explain the phenomena of boundary layer formation and various regions on flat plate. | 10 | 6 | Understanding |
|-----|--|----|---|---------------|