

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.	Develop an expression for 3-dimensional conduction equation in rectangular Cartesian coordinate system and deduce different forms from it by simplified assumptions.	14M	1	6
	(OR)			
2.	a) Develop an expression for temperature distribution in the case of a hollow cylinder having thermal conductivity k , with inner and outer radii r_1 and r_2 subjected to temperatures T_1 and T_2 respectively and hence deduce an expression for heat transfer rate also.	7M	1	6
	b) The wall of a cold room is composed of three layers. The outer layer is brick 30 cm thick. The middle layer is cork 20 cm thick, the inside layer is cement 15 cm thick. The temperature of the outside air is 25°C and on the inside air is -20°C . The film coefficient for outside air and brick is $55.4 \text{ W/m}^2\text{K}$. Film coefficient for inside air and cement is $17 \text{ W/m}^2\text{K}$. Find heat flow rate. Take: 'k' for brick = 2.5 W/mK 'k' for cork = 0.05 W/mK 'k' for cement = 0.28 W/mK	7M	1	3
	<u>UNIT-II</u>			
3.	a) Develop and expression for the temperature distribution and heat transfer rate for a short fin with an insulated case.	7M	2	6
	b) During heat treatment, cylindrical pieces of 25mm dia, 30mm height and 30°C are placed at 750°C with convection coefficient $80 \text{ W/m}^2 \text{ deg}$ at the surface. Calculate the time required to heat the pieces to 600°C ? What will be the short fall in temperature if the pieces are taken out from the furnace after 280 sec. Assume density = 7850 kg/m^3 , specific heat 480 J/kg K and conductivity 40 W/m K .	7M	2	3
	(OR)			
4.	a) What is Lumped system analysis? What is the criteria for it, and state some applications where such analysis can be applicable.	7M	2	1
	b) A carbon steel pipe ($k = 45 \text{ W/mK}$), 78 mm inner diameter and 5.5 mm thick has eight longitudinal fins 1.5 mm thick. Each fin extends 30 mm from the pipe wall. If the wall temperature, ambient temperature and surface heat transfer coefficients are 150°C , 28°C and $75 \text{ W/m}^2\text{K}$ respectively. Calculate the percentage increase in heat transfer rate from the finned tube over the plain tube.	7M	2	3

UNIT-III

5. a) Distinguish between (i) Forced and (ii) Natural convection. 4M 3 2
b) Air at 25 °C and at atmospheric pressure flows over a flat plate at 3 m/s. If the plate is 1 m wide and the wall is maintained at 75 °C, calculate the following at location $x = 1\text{m}$ from the leading edge: (i) hydrodynamic and thermal boundary layer thickness (ii) Local and average heat transfer coefficient (iii) The total rate of heat transfer (iv) The total drag force due to friction. Properties of air at 50 °C are $\rho=1.093\text{ kg/m}^3$, $\nu= 17.95 \times 10^{-6}\text{ m}^2/\text{s}$, $k = 0.0282\text{ W/mK}$, $C_p = 1.005\text{ kJ/kgK}$ 10M 3 3

(OR)

6. a) Explain the significance of (i) Nusselt (ii) Reynold's (iii) Grashoff and (iv) Prandtl numbers in convection heat transfer. 7M 3 2
b) Find the rate of heat loss from a human body by convection to surrounding air. The body can be approximated as a vertical cylinder of 25 cm in diameter and 175 cm height. The air is at 13 °C and the body is at 37 °C. 7M 3 3

UNIT-IV

7. a) Distinguish between Boiling and Condensation and give some practical applications of them. 4M 4 2
b) Explain briefly about the following (i) Assumptions made in Nusselt's theory of condensation and (ii) Film wise and Dropwise condensation. 10M 4 1

(OR)

8. a) Distinguish between LMTD and NTU methods 4M 4 2
b) In a tubular counter-flow heat exchanger, water is heated from 40 °C to 80 °C by hot flue gases ($C_{pg}= 1.0\text{ kJ/kg K}$). The hot gas enters at 200 °C and leaves at 100 °C. The overall heat transfer coefficient of the exchanger is 200 W/m² K. Find the area of the heat exchanger by (a) LMTD method (b) NTU method. Assume that the water enters the heat exchanger at 1060 kg/h. 10M 4 2

UNIT-V

9. a) State and Prove Wein's displacement law. 7M 5 6
b) Two large parallel plates at temperatures 800 K and 600 K having emissivities of 0.5 and 0.8 respectively. A radiation shield having emissivity of 0.1 on one side and 0.05 on the other side is placed between the plates. Calculate the heat transfer by radiation per unit area with and without radiation shield. 7M 5 3

(OR)

10. a) Explain the analogy between heat and mass transfer by stating their equivalent laws. 7M 5 2
b) A vessel contains a mixture of 2 kmol of CO₂ and 4.5 kmol of air at 1 bar and 25°C. If air contains 21 % oxygen and 79% nitrogen by volume, calculate for the mixture:
(i) The mass of CO₂, O₂ and N₂, and the total mass;
(ii) The percentage carbon content by mass;
(iii) The molar mass and the gas constant for the mixture;
(iv) The specific volume of the mixture. 7M 5 3

Time: 3 Hours

Max Marks: 70

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		<u>UNIT-I</u>	Marks	CO	BTL
1.	a)	Differentiate between Multiprocessors and Multicomputers based on architecture, processing speed, usage and cost.	7	1	2
	b)	Discuss about Fixed and Floating point representations.	7	1	2
		(OR)			
2.	a)	Draw Von-Nuemann architecture. Explain its advantages and disadvantages.	7	1	2
	b)	Illustrate Multiplication and division of binary numbers.	7	1	2
		<u>UNIT-II</u>			
3.	a)	What is a carry-lookahead adder, and how does it improve the speed of binary addition? Discuss its advantages and limitations.	7	2	2
	b)	What is a full adder? Draw the circuit of a full adder.	7	2	2
		(OR)			
4.	a)	Explain the concept of universal gates with examples. Prove that NAND and NOR gates can be used to implement all basic logic operations (AND, OR, NOT).	7	2	3
	b)	Design a half adder circuit using basic logic gates. Derive the Boolean expressions for the sum and carry outputs, and draw the logic diagram.	7	2	3
		<u>UNIT-III</u>			
5.	a)	With a neat flowchart, explain how the control unit decodes an instruction.	7	3	2
	b)	Discuss the significance of registers in the CPU architecture. Provide examples of different types of registers and their roles during instruction execution.	7	3	2
		(OR)			
6.	a)	Describe the different instruction formats used in a CPU's instruction set. How does the format affect the instruction's execution?	7	3	2
	b)	Discuss about any four addressing modes with suitable examples.	7	3	2
		<u>UNIT-IV</u>			
7.	a)	Differentiate between various types of memories used in a computer.	7	4	2
	b)	What is Virtual address? How it is converted to physical address during the execution of a program?	7	4	2
		(OR)			
8.	a)	Discuss about various paging techniques.	7	4	2
	b)	Differentiate between associative mapping and set-associative mapping. What are the advantages and disadvantages of each?	7	4	2
		<u>UNIT-V</u>			
9.	a)	What is interrupt-driven I/O? Discuss its advantages over programmed I/O, and explain how interrupts are handled by the CPU.	7	5	2
	b)	Define DMA and describe its working mechanism. How does it improve the efficiency of data transfer between I/O devices and memory?	7	5	2
		(OR)			
10.	a)	What are the key characteristics of a multiprocessor system? Explain how multiprocessors enhance system performance.	7	5	2
	b)	What is cache coherence? Explain the challenges of maintaining coherence in a multiprocessor system and describe one coherence protocol.	7	5	2

Time: 3 Hours**Max Marks: 70**

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	<u>UNIT-I</u>	Marks	CO	Blooms Level
1. a)	With a neat schematic layout of TPS, explain the operation of various components of coal fired thermal stations.	10	1	3
b)	With a neat schematic, explain the operation of a water tube boiler.	4	1	2
	(OR)			
2. a)	What are the different parameters to be considered to construct a hydro electric power plant. Explain in detail.	10	1	2
b)	Classify hydroelectric power plants in different ways.	4	1	2
	<u>UNIT-II</u>			
3. a)	Explain the principle of solar photovoltaic power generation.	6	2	2
b)	Explain about: (a) Solar distillation. (b) Solar cooling. (c) Solar drying.	8	2	3
	(OR)			
4. a)	Explain the importance of breeder reactors in nuclear power station.	4	2	2
b)	Draw schematic arrangement of a nuclear power station and explain each part.	10	2	3
	<u>UNIT-III</u>			
5.	Derive the expression for voltage drop and power loss of non-uniformly distributed loads.	14	3	2
	(OR)			
6. a)	A 2-wire D.C ring distributor is 300 m long and is fed at 240 V at point A. At point B, 150 m from A, a load of 120 A is taken and at C, 100 m in the opposite direction, a load of 80 A is taken. If the resistance per 100 m of single conductor is 0.03Ω , find: (i) current in each section of distributor (ii) voltage at points B and C.	10	3	3
b)	Classify different types of primary feeders and give their merits and demerits.	4	3	2
	<u>UNIT-IV</u>			
7. a)	What are the various factors that are to be considered in selecting optimal location of substation.	4	4	2
b)	Draw and Explain a 33/11 kV substation line diagram.	10	4	3
	(OR)			
8. a)	List out the advantages and disadvantages of Gas Insulated Substations.	10	4	3
b)	Draw the single line diagram of a gas insulated substation.	4	4	2
	<u>UNIT-V</u>			
9. a)	A factory has a maximum load of 240 kW at 0.8 p.f. lagging with an annual consumption of 50,000 units. The tariff is Rs. 50 per kVA of maximum demand plus 10 paise per unit. Calculate the flat rate of energy consumption. What will be annual saving if p.f. is raised to unity.	10	5	3
b)	Classify various tariffs.	4	5	2
	(OR)			
10. a)	Write the procedural steps to draw the load duration curve with example.	7	5	2
b)	Explain the division of cost of electrical energy generated and express the total cost in three part form and two part form.	7	5	2

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		Marks	CO	Blooms Level
<u>UNIT-I</u>				
1.	a) Discuss the Maxwell's equations for electrostatic fields.	7	CO1	L2
	b) Write short note on Continuity Equation	7	CO1	L2
(OR)				
2.	a) State and explain Coulomb's law. Obtain an expression in vector form.	7	CO1	L1
	b) Explain Poisson's and Laplace's Equations.	7	CO1	L2
<u>UNIT-II</u>				
3.	a) Define Ampere's circuit law and prove it with the help of suitable diagram.	7	CO2	L1
	b) Derive an expression for magnetic field intensity due to infinitely long straight conductor.	7	CO2	L3
(OR)				
4.	a) Derive the equation of Force on moving charge due to electric and magnetic fields	7	CO2	L3
	b) State and Explain about Biot-Savarts law.	7	CO2	L1
<u>UNIT-III</u>				
5.	a) Discuss the Faraday's law in detail.	7	CO3	L1
	b) What is inconsistency associated with Amphere's law and Displacement current Density.	7	CO3	L2
(OR)				
6.	a) Write the maxwell's equations of EM static field in point form and integral form?	7	CO3	L2
	b) State and explain the boundary conditions of the electric and magnetic fields.	7	CO3	L2
<u>UNIT-IV</u>				
7.	a) Explain the different types of polarization.	7	CO4	L2
	b) Discuss the characteristics of uniform plane wave in perfect dielectric.	7	CO4	L2
(OR)				
8.	a) Find the relations between E and H in a uniform plane wave.	7	CO4	L3
	b) State and prove Poynting Theorem.	7	CO4	L2
<u>UNIT-V</u>				
9.	a) Derive the transmission line equations	7	CO5	L2
	b) Discuss the single stub matching in detail with a suitable diagram.	7	CO5	L2
(OR)				
10.	a) Define the reflection coefficient and derive the expression for the input impedance in terms of reflection coefficient	7	CO5	L1
	b) A $50\text{-}\Omega$ lossless transmission line is terminated in a load with impedance $Z_L = (30 - j50)\text{ }\Omega$. The wavelength is 8 cm. Find: (a) the reflection coefficient at the load, (b) the standing-wave ratio on the line, (c) the position of the voltage maximum nearest the load, (d) the position of the current maximum nearest the load.	7	CO5	L3

**Software Engineering
(COMPUTER SCIENCE AND ENGINEERING)****Time: 3 Hours****Max Marks: 70**

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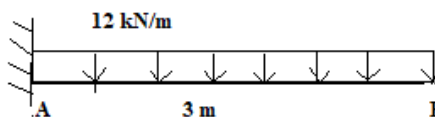
		Marks	CO	Blooms Level
<u>UNIT-I</u>				
1.	a) What are the key challenges in software development?	7M	CO1	K3
	b) Describe the importance of system requirements and their classification.	7M	CO1	K2
(OR)				
2.	a) Explain the various stages of the Requirements Engineering process	7M	CO1	K2
	b) What is the role of a feasibility study in software development?	7M	CO1	K3
<u>UNIT-II</u>				
3.	a) Illustrate the advantages and disadvantages of the Incremental process model.	7M	CO2	K2
	b) Discuss the differences between the Spiral and RAD models.	7M	CO2	K2
(OR)				
4.	a) Explain the key principles of Agile development.	7M	CO2	K2
	b) What is the significance of Scrum methodology in software projects?	7M	CO2	K3
<u>UNIT-III</u>				
5.	a) Explain the various design quality attributes in software engineering.	7M	CO3	K2
	b) What are software design patterns? Explain with examples.	7M	CO3	K3
(OR)				
6.	a) Describe the importance of software architecture in large-scale software systems.	7M	CO3	K2
	b) Explain the user interface design principles and their impact on user experience.	7M	CO3	K2
<u>UNIT-IV</u>				
7.	a) Differentiate between unit testing and system testing.	7M	CO4	K2
	b) Explain the different debugging techniques used in software testing.	7M	CO4	K2
(OR)				
8.	a) What is equivalence partitioning? Illustrate with an example.	7M	CO4	K3
	b) Describe the importance of white-box testing techniques.	7M	CO4	K2
<u>UNIT-V</u>				
9.	a) Explain the concept of software quality assurance and its significance.	7M	CO5	K2
	b) Describe different software estimation techniques used in project planning.	7M	CO5	K2
(OR)				
10.	a) What are Formal Technical Reviews (FTRs)? Explain their role in software development.	7M	CO5	K3
	b) Discuss the different metrics used in software reliability measurement.	7M	CO5	K2

Answer ONE Question from each Unit

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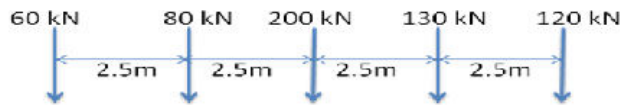
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		Marks	CO	Blooms Level
<u>UNIT-I</u>				
1.	a) Find the maximum slope and deflection in a simply supported beam of span 'L' carrying a uniformly distributed load of intensity 'w' kN/m over the entire span.	7 M	1	L3
	b) Find the maximum deflection and slope in a cantilever beam of span 'L' carrying a point load 'P' at free end.	7 M	1	L3
(OR)				
2.	A horizontal beam of uniform section and 6 meters long is simply supported at its ends. Two vertical concentrated loads of 48 kN and 40 kN act at 1 m and 3 m respectively from the left-hand support. Determine the magnitude of the deflection under the loads and maximum deflection using Macaulay's method. If $E = 200 \text{ GN/m}^2$ and $I = 85 \times 10^{-6} \text{ m}^4$.	14 M	1	L3
<u>UNIT-II</u>				
3.	a) Derive an expression for strain energy for a beam AB of length 'L' due to shear force.	7 M	2	L2
	b) A simply supported beam of length 'L' carries a concentrated load 'P' at distance 'a' from left end and 'b' from right end. Using Castigliano's theorem-1 find the deflection under the load. Assume uniform flexural rigidity.	7 M	2	L3
(OR)				
4.	a) State Castigliano's first theorem and find the strain energy stored in a simply supported beam of span 'L' subjected to a UDL of intensity 'w' kN/m over the entire span.	7 M	2	L3
	b) Determine the vertical and horizontal deflection of the free end B of a cantilever shown. Given 200 GPa , $I = 71.1 \times 10^6 \text{ mm}^4$	7 M	2	L3



UNIT-III

5. A train of 5 wheel-loads as shown in figure crosses a simply supported beam AB of span 22.5m. 14 M 3 L3



Determine a) Absolute maximum +ve and -ve shear force b) The absolute maximum bending moment anywhere in the span.

(OR)

6. A live load of 40 kN/m of 5 m long crosses a girder having a span of 40 m. Calculate maximum positive and negative shear force at a section 8m from the left support. Bending moment at a section 8m from the left support. Calculate absolute maximum bending moment in the beam. 14 M 3 L3

UNIT-IV

7. A beam AB 6 m long is fixed at A and simply supported at B. The beam carries point loads 18 kN and 36 kN at distances 2 m and 4 m respectively from end A. Find support reactions. Find what couple should be applied at the end B so as to completely neutralize the moment at A. 14 M 4 L3

(OR)

8. Determine the moments and reactions at the supports of the fixed-fixed beam which is loaded by a concentrated load of 10 kN at a point 3 m from the left support. The span of the beam is 8 m. EI is constant. Also sketch SFD and BMD. 14 M 4 L3

UNIT-V

9. A three-hinged parabolic arch has a span of 24 m and a rise to the central hinge of 4 m. The arch is loaded with two vertical 20 kN loads symmetrically situated on either side of the central hinge at 3 m horizontally from the hinge. Calculate the support reactions. Find the position and magnitude of maximum positive bending moment that occurs in the arch. 14 M 5 L3

(OR)

10. A two-hinged parabolic arch of span 60 m and central rise 10 m with secant variation of inertia is subjected to two-point loads of 40 kN each, at one third points. Determine the horizontal thrust at abutments & plot the B.M.D. 14 M 5 L3

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		Marks	CO	Blooms Level
	<u>UNIT-I</u>			
1.	a) What are the Java Buzzwords? Explain.	7	CO1	2
	b) Explain about operators in Java with an example program.	7	CO1	2
	(OR)			
2.	a) Write a Java Program to read two matrices and to perform Matrix multiplication.	7	CO1	3
	b) Discuss String Buffer methods.	7	CO1	2
	<u>UNIT-II</u>			
3.	a) Define class. Explain its declaration and modifiers with an example.	7	CO2	2
	b) Explain about method overloading with an example program.	7	CO2	3
	(OR)			
4.	a) What is the use of static keyword? Explain with an example.	7	CO2	3
	b) Explain garbage collection with help of finalize() method.	7	CO2	2
	<u>UNIT-III</u>			
5.	a) Why multiple inheritance is not available in Java and explain how to implement it?	7	CO3	2
	b) Discuss about super keyword and final keyword with an example.	7	CO3	2
	(OR)			
6.	a) Distinguish between Abstract Classes and Interfaces.	7	CO3	2
	b) What is polymorphism? Write a Java program to illustrate dynamic method dispatch.	7	CO3	3
	<u>UNIT-IV</u>			
7.	a) What is a package? Illustrate the steps to create a package, compile, and execute a package.	7	CO4	2
	b) Explain the concept of exception handling with suitable example.	7	CO5	2
	(OR)			
8.	a) Explain about built-in exceptions in java.	7	CO5	2
	b) Explain the difference between the throw and throws clauses with an example.	7	CO5	2
	<u>UNIT-V</u>			
9.	a) Write a Java program to implement a Runnable interface.	7	CO5	2
	b) Discuss in detail about life cycle of an Applet with neat diagram.	7	CO5	2
	(OR)			
10.	a) Write a Java program for passing parameters to Applet.	7	CO5	2
	b) How to create multiple Threads? Explain with an example.	7	CO5	2

**STRENGTH OF MATERIALS
(MECHANICAL ENGINEERING)**

Time: 3 Hours

Max Marks: 60

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UNIT-I

1. Define the following terms.
(i) Modulus of Elasticity (ii) Yield strength (iii) volumetric strain
(iv) Longitudinal Strain (v) Poisson's ratio

Marks	CO	Blooms Level
10	1	Understand

(OR)

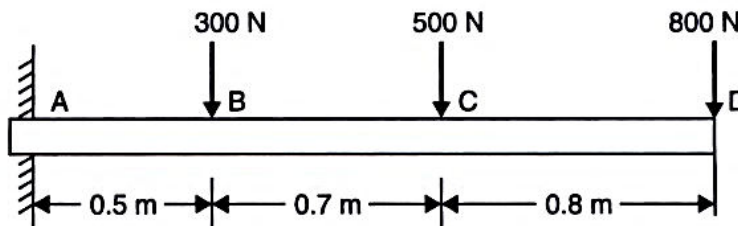
2. A steel rod of 3 cm diameter and 5m long is connected to two grips and the rod is maintained at a temperature of 95°C. Determine the stress and pull exerted when the temperature falls to 30°C, if the ends do not yield, and the ends yield by 0.12 cm Take $E = 2 \times 10^5$ MN/m² and $\alpha = 12 \times 10^{-6}/^\circ\text{C}$.

10	1	Understand
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UNIT-II

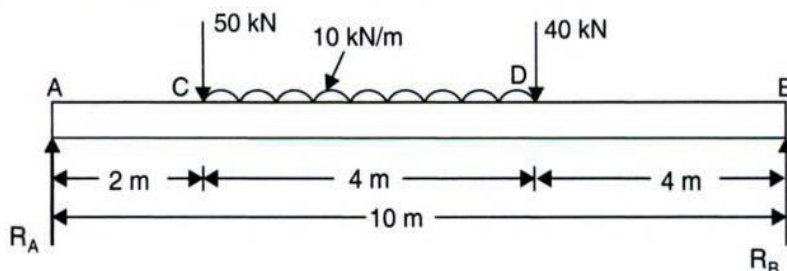
3. A cantilever beam of length 2 m carries the point loads as shown in fig. Draw the shear force and Bending moment diagrams for the cantilever beam.

10	2	Apply
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**(OR)**

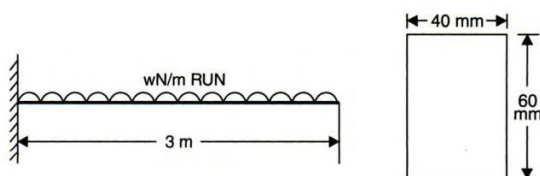
4. A simply supported beam of length of 10m, carries Uniformly distributed load and two-point loads shown in figure. Draw the shear force and bending moment diagrams for the beam. Also find the maximum bending moment and its location in the beam.

10	2	Apply
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**UNIT-III**

5. A square beam 20 mm × 20 mm in section and 2m long is supported at the ends. The beam fails when a point load of 400 N is applied at the center of the beam. What uniformly distributed load per meter length will break a cantilever of the same material 40 mm wide, 60 mm deep and 3m long ?

10	3	Apply
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(OR)					
6.	Derive the shear stress equation for a simple beam having rectangular cross section.	10	3	Understand	
<u>UNIT-IV</u>					
7.	Derive the expression for stresses in a thick cylindrical shell	10	4	understand	
(OR)					
8.	The shearing stress in a solid shaft is not to exceed 40 N/mm^2 and the torque transmitted is 20 kN-m . Determine the minimum diameter of the shaft.	10	4	Apply	
<u>UNIT-V</u>					
9.	a List the assumptions made in the Euler's Column Theory:	4	5	Understand	
	b Give the relation between actual length and effective length while measuring the crippling load of a column under the following conditions.	6	5	Understand	
	1. One end is fixed and other is free				
	2. Both ends are fixed				
	3. One end is fixed and other is Hinged				
(OR)					
10.	Derive the expression for crippling load of a column in terms of actual length, when the column is hinged at both ends.	10	5	Understand	
<u>UNIT-VI</u>					
11.	Deduce the expression for deflection and slope for a cantilever beam with a udl.	10	4	Understand	
(OR)					
12.	A 6 m simple beam is carrying a udl of 25 kN/m over its entire span and two-point loads of 15 kN at 1.5 m from both ends. Find the slope and deflection at important locations of beam, using moment-area method. Take $E = 200 \text{ GPa}$ and $I = 3.32 \times 10^{-4} \text{ m}^4$.	10	4	Apply	

CONTROL SYSTEMS
(ELECTRICAL AND ELECTRONICS ENGINEERING)

Time: 3 Hours

Max Marks: 60

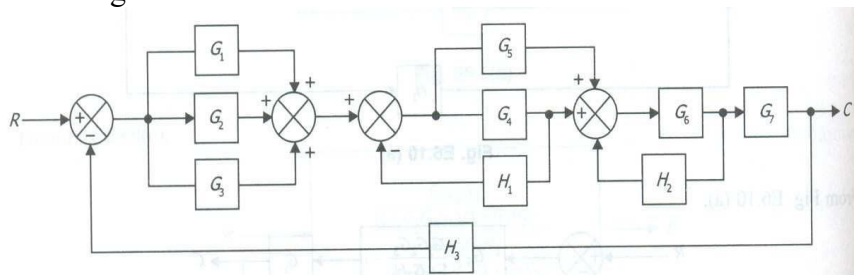
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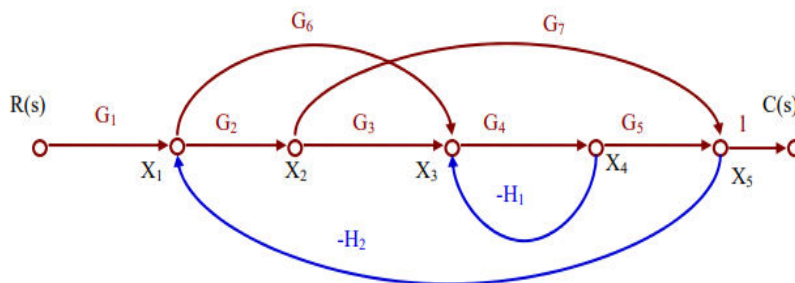
UNIT-I

- | | Marks | CO | Blooms Level |
|---|-------|-----|--------------|
| 1. a) What are the basic elements used for modelling rotational mechanical system? Write its force balance equations? | 4M | CO1 | L2 |
| b) Determine the transfer function $C(s) / R(s)$ by reducing the given block diagram | 6M | CO1 | L3 |



(OR)

- | | | | |
|---|----|-----|----|
| 2. a) Define loop, forward path, input node and output node in flow graph. | 4M | CO1 | L2 |
| b) Find the transfer function of the system shown in figure using Mason's gain formula? | 6M | CO1 | L3 |

**UNIT-II**

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|---|----|-----|----|
| 3. a) Derive the response of a standard under damped second order system for unit step input. | 4M | CO2 | L3 |
| b) A unity feedback system has an open-loop transfer function $G(s) = \frac{k}{s(s+10)}$. | 6M | CO2 | L3 |

Determine K so that the system will have a damping ratio 0.5. For this value of K, determine peak over shoot, time for peak over shoot and settling time for the unit step input.

(OR)

- | | | | |
|--|----|-----|----|
| 4. a) Derive the transfer function of field controlled DC Servo motor. | 5M | CO2 | L3 |
| b) Consider a unity-feedback control system with the closed-loop transfer function $\frac{C(s)}{R(s)} = \frac{Ks+b}{s^2+as+b}$ | 5M | CO2 | L3 |

Determine the open-loop transfer function? show that the steady-state error in the unit-ramp response is given by $\frac{(a-K)}{b}$

UNIT-III

5. a) Construct Routh array and determine the stability of the system whose characteristic equation is

$$s^6 + 2s^5 + 8s^4 + 12s^3 + 20s^2 + 16s + 16 = 0$$
4M CO3 L4
- b) What are rules in construction of root loci ?
6M CO3 L2

(OR)

6. A unity feedback system has open loop transfer function

$$G(s)H(s) = \frac{k}{s(s^2 + 4s + 13)}$$
10M CO3 L4

Sketch the root locus as a function of K, find the range of K for which system is stable.

UNIT-IV

7. a) Define GM, PM and gain crossover frequency and phase crossover frequency.
4M CO4 L3
- b) Sketch the Bode plot for the open loop transfer function for the unity feedback system given below.
6M CO4 L4

$$G(s) = \frac{10}{s(1 + 0.4s)(1 + 0.1s)}$$

(OR)

8. Draw the Nyquist plot for the system, whose open-loop transfer function is given as $G(s) = \frac{k}{s(s+2)(s+10)}$.
10M CO4 L4

UNIT-V

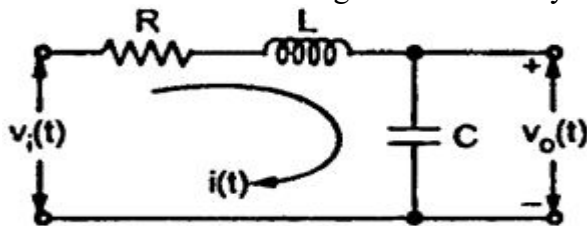
9. Explain the procedure for designing lag-lead compensator using root locus.
10M CO5 L3

(OR)

10. a) Draw the electrical circuit diagram that represents the Lead Compensator.
5M CO5 L3
- b) Sketch the frequency response of Lead Compensator.
5M CO5 L3

UNIT-VI

11. a) What is state transition matrix and write its properties.
5M CO6 L2
- b) Obtain the state model of given electrical system.
5M CO6 L3



(OR)

12. a) Explain the concepts of Controllability and Observability.
4M CO6 L2
- b) A system is characterised by the transfer function

$$\frac{Y(s)}{U(s)} = \frac{2}{s^3 + 6s^2 + 11s + 6}$$
6M CO6 L3

Test the controllability and observability of the system.

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.	Explain the a) Transmission line equation and its types? b) List the characteristics of transmission line? (OR)	10	1	
2.	Explain a) Infinite Line b) Lossless line c) Distortion less line	10	1	Understanding
<u>UNIT-II</u>		Marks	CO	Blooms Level
3.	What is the SC and OC Lines? Explain with suitable expressions? (OR)	10	2	Remembering
4.	What is Smith chart how it is used to find the Impedance Transmission line?	10	2	Analyzing
<u>UNIT-III</u>		Marks	CO	Blooms Level
5.	Explain a) Del operator and Gradient Vector? b) What is Laplacian operator? (OR)	10	3	Understanding
6.	Explain a) Coulomb's Law b) Electric Field Intensity c) Electric Flux Density d) Gauss Law	10	3	Remembering
<u>UNIT-IV</u>		Marks	CO	Blooms Level
7.	Explain a) Magnetic Density Flux b) Forces due to Magnetic Fields (OR)	10	4	Understanding
8.	Explain Maxwell's Two Equations for Magneto Static fields			Applying
<u>UNIT-V</u>		Marks	CO	Blooms Level
9.	Explain a) Faraday's law and emf b) Inconsistency of Ampere's Law (OR)	10	5	Understanding
10.	Explain Maxwell's Equations in Different Final Forms and Word Statements?	10	5	Analyzing
<u>UNIT-VI</u>		Marks	CO	Blooms Level
11.	Explain a) Good Conductors b) Good Dielectrics (OR)	10	6	Understanding
12.	a) What is Poynting Theorem b) What is Polarization	10	6	Understanding

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

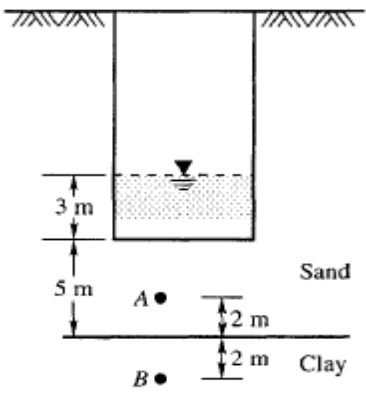
		Marks	CO	Blooms Level
<u>UNIT-I</u>				
1.	a) Differentiate between time-sharing and real-time operating systems.	5	CO1	K4
	b) Distinguish between multiprogramming and parallel processing.	5	CO1	K4
(OR)				
2.	a) Write notes on the evolution of the operating system. Explain the function of the operating system.	5	CO1	K2
	b) What are system calls? What are the types of system calls?	5	CO1	K2
<u>UNIT-II</u>				
3.	a) Draw the process state transition diagram and explain it.	5	CO2	K2
	b) Differentiate between multilevel queues and multilevel feedback queues.	5	CO2	K4
(OR)				
4.	a) Explain the types of schedulers context switching and dispatcher.	5	CO2	K1
	b) What is CPU scheduling? Explain FCFS algorithm.	5	CO2	K3
<u>UNIT-III</u>				
5.	What is a Resource Allocation Graph (RAG)? Explain how RAG is very useful? Explain Banker's Algorithm in detail.	10	CO3	K4
(OR)				
6.	a) What is deadlock? What are the necessary conditions an operating system must satisfy for a deadlock to occur?	5	CO3	K3
	b) How can deadlock be detected? Explain.	5	CO3	K3
<u>UNIT-IV</u>				
7.	a) What is page segmentation? Explain with an example.	5	CO4	K3
	b) Explain the LRU page replacement algorithms.	5	CO4	K3
(OR)				
8.	a) What is paging? How does page swapping in virtual memory? Explain.	5	CO4	K3
	b) What is thrashing, explain demand paging in detail?	5	CO4	K2
<u>UNIT-V</u>				
9.	What is a file? What are the various file operations? What are the information associated with an open file?	10	CO5	K4
(OR)				
10.	What are the allocation methods of a disk space? List various layers of a file system.	10	CO5	K3
<u>UNIT-VI</u>				
11.	Explain the various Disk Scheduling algorithms with examples.	10	CO6	K3
(OR)				
12.	a) Explain any 2 disk space allocation methods?	5	CO6	K3
	b) Consider a file system where a file can be deleted and the disk space reclaimed while the links to that file still exist. What problems may occur if a new file is created in the same storage area or with the same absolute pathname? How these problems be avoided?	5	CO6	K4

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.	Write the process of soil formation and differentiate between residual and transported soils.	10M	1	1
(OR)				
2.	Derive the formula between soil moisture content(w), degree of saturation(S), specific gravity(G) and void ratio(e).	10M	1	2
<u>UNIT-II</u>				
3.	With neat sketch, explain how do you determine the coefficient of permeability of pervious soils in the laboratory.	10M	2	2
(OR)				
4.	Explain in detail with neat sketch construction of flow nets by graphical method.	10M	2	2
<u>UNIT-III</u>				
5. a.	The depth of water in a well is 3 m. Below the bottom of the well lies a layer of sand 5 meters thick overlying a clay deposit. The specific gravity of the solids of sand and clay are respectively 2.64 and 2.70. Their water contents are respectively 25 and 20%. Compute the total, intergranular and pore water pressures at points A and B shown in figure.	5M	5	3
				
b.	Explain the process of determining the stresses when no flow takes place through the saturated soil mass.	5M	5	2
(OR)				
6.	Explain the terms Total stress, Effective stress and natural stress with neat diagram and Derive an expression between them	10M	5	2
<u>UNIT-IV</u>				
7.	Define the terms Coefficient of compressibility, coefficient of volume change, compression index	10M	4	1
(OR)				

8.	Explain in detail the factors affecting compaction.	10M	4	2
<u>UNIT-V</u>				
9.	a. Explain how Newmark's influence chart is constructed?	5M	3	2
	b. What are the basic assumptions in Boussinesq's theory of stress distribution in soils?	5M	3	1
(OR)				
10.	a. A concentrated load of 22.5kN acts on the surface of a homogenous soil mass of large extent. Find the stress intensity at a depth of 15m and i. directly under the load and ii. at a horizontal distance of 7.5m. Use Boussinesq theory.	5M	3	3
	b. Explain the assumptions in Westergaard theory.	5M	3	1
<u>UNIT-VI</u>				
11.	a. Explain the principle of direct shear test. What re the advantages of this test? What are its limitations?	5M	6	2
	b. Draw and explain the Mohr-Coulomb strength envelope.	5M	6	2
(OR)				
12.	a. Write about (i) Liquefaction.	5M	6	1
	b. (ii) Unconfined compression test.	5M	6	2

AR18

CODE: 18EET209

SET-1

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

II B. Tech II Semester Supplementary Examinations, July, 2025

CONTROL SYSTEMS (Electrical and Electronics Engineering)

Time: 3 Hours

Max Marks: 60

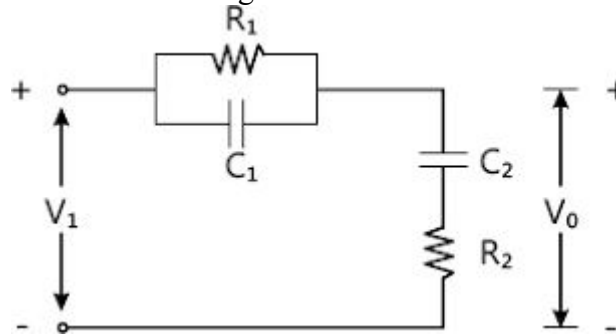
Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

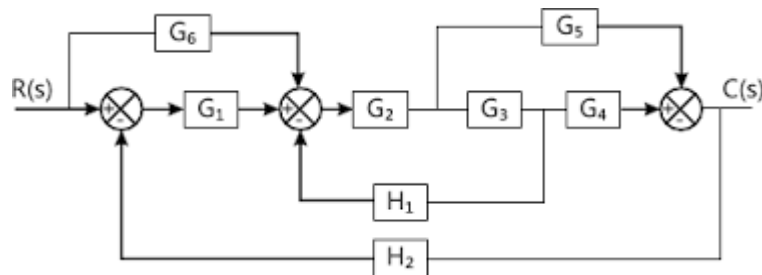
UNIT-I

1. a) Differentiate between open loop and closed loop control systems 4M
- b) Derive the Transfer function of the given electrical network shown in figure below. 8M

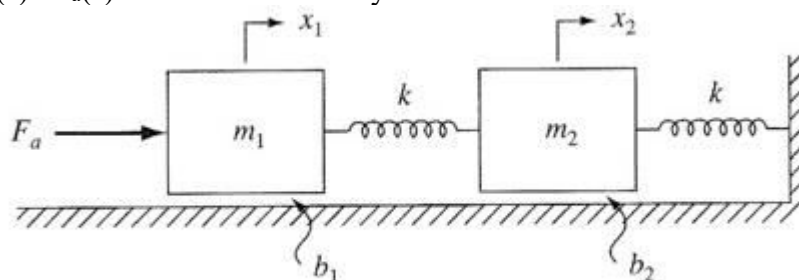


(OR)

2. a) Derive the Transfer function of the Block Diagram using Block Diagram Reduction Technique. 6M



- b) For the mechanical system shown in figure below. Derive the Transfer function $X_2(s) / F_a(s)$ of the mechanical system. 6M



UNIT-II

3. a) Explain the operation of synchro as error detector. 6M
b) The open loop transfer function of a feedback control system is given by 6M
$$G(s)H(s) = \frac{400}{s^2(s+4)(s+12)}$$
. Determine the static error coefficients. Also determine the steady state error for the input $r(t) = 2t^2 + 5t + 10$.

(OR)

4. a) The open loop transfer function of a unity feedback control system is given by 6M
$$\frac{9}{s(s+3)}$$
. Find natural frequency of response, damping ratio, damped frequency and time constant.
- b) Derive the expression for transient response of second order system when excited by step input. 6M

UNIT-III

5. a) Examine the stability by Routh's criterion for the given characteristic equation 6M
$$s^5 + s^4 + 2s^3 + 2s^2 + 3s + 15 = 0$$

b) Explain in detail about Routh Hurwitz criteria for stability. 6M
- (OR)**
6. a) Explain the step by step procedure for construction of root locus for open loop transfer function of control system. 8M
b) Write a short note on 4M
I. Break even point
II. Break away point
III. Angle of arrival
IV. Angle of Departure.

UNIT-IV

7. Sketch the Bode plot of given open loop transfer function $G(s) = \frac{100}{s(s+5)(s+10)}$. 12M
Determine the phase margin and gain margin from the plot.

(OR)

8. a) Sketch the polar plot for the open loop system given as $G(s) = \frac{s+4}{(s+1)(s-1)}$ 8M
b) Explain in detail about the significance of Nyquist plot? 4M

UNIT-V

9. a) Classify the types of compensators and briefly explain about it. 6M
b) What is lead compensator? Obtain the transfer function of lead compensator. 6M
Sketch the pole-zero plot.

(OR)

10. a) List the properties of state transition matrix 4M
b) Consider an autonomous system characterised by state equation $\dot{X} = AX$ 8M

Where
$$A = \begin{bmatrix} -3 & 1 & 0 \\ 0 & -3 & 1 \\ 0 & 0 & -2 \end{bmatrix}$$

Determine the State Transition Matrix.

AR18

CODE: 18ECT209

SET-1

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

II B. Tech II Semester Supplementary Examinations, July, 2025

**DIGITAL ELECTRONICS
(Electronics and Communication 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) Solve for X. 6M

i) $(1256)_8 = (X)_2$

ii) $(19.125)_{10} = (X)_8$

iii) $(10011.11)_2 = (X)_{16}$

- b) List and explain different error detecting codes with examples. 6M

(OR)

2. a) Explain the procedure involved in subtraction of binary numbers using 1's and 2's complements with an example. 6M

- b) Explain alphanumeric and self-complement codes with examples. 6M

UNIT-II

3. a) Obtain the minimal expression for $f = \sum m(1, 2, 3, 6, 7, 8)$ using tabular method and verify the result with K-map. 6M

- b) Express the following functions in sum of minterms and product of maxterms form. 6M

i. $(A,B,C,D)=AB+BC+AD$

ii. $F(x,y,z)=(xy+z)(xz+y)$

(OR)

4. a) Implement all logic gates using NOR gates only. 6M

- b) Find the complement of the following Boolean expressions. 6M

i) $x\bar{y} + \bar{x}y$

ii) $(A\bar{B} + C)\bar{D} + E$

UNIT-III

5. a) Realize full adder using two half adders and logic gates. 6M
b) Design a 4-bit carry look ahead adder. 6M

(OR)

6. a) Explain the operation of an excess-3 adder. 6M
b) Design a 4-bit binary parallel subtractor. 6M

UNIT-IV

7. a) Implement the logic function $F(A,B,C) = \sum m(1,2,4,7)$ using 4x1 multiplexer. 6M
b) Design a 2-bit magnitude comparator using logic gates. 6M

(OR)

8. a) Explain the operation of a 3X8 decoder with truth table and design a 4X16 decoder using 3X8 decoders. 6M
b) Explain the principle involved in priority encoder. 6M

UNIT-V

9. a) Explain the operation of universal shift register. 6M
b) Convert JK flip flop into D flip flop. 6M

(OR)

10. a) Design a mod-6 asynchronous counter using T flip flops. 6M
b) Draw and explain a 4-bit twisted ring counter. 6M

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) With a neat sketch explain the characteristics of water surface profile in critical sloped channels. [5M]
- b) A rectangular channel 3.5m wide is laid on a slope of 0.0005. Calculate the normal depth of flow for a discharge of $5\text{ m}^3/\text{s}$ in this channel. The Manning's coefficient can be taken as 0.02. [7M]

(OR)

2. a) What are the assumptions made for deriving dynamic equation for gradually varied flow? [4M]
- b) Show that the head loss in a hydraulic jump formed in a rectangular channel may be expressed as $\Delta E = \frac{(v_1 - v_2)^3}{2g(v_1 + v_2)}$ [8M]

UNIT-II

3. a) How to find the work done and efficiency when flow is over radial vanes? [5M]
- b) A jet of water 6 cm in diameter moving with a velocity of 30 m/s strikes a fixed flat plate in such a way that the angle between the Jet axis and plate is 60° . Find the force exerted on plate (i) in the direction normal to plate (ii) in the direction of the Jet. [7M]

(OR)

4. A 3 cm diameter of Jet strikes without shock on a series of vanes. The Jet velocity is 50 m/sec and vane moves in the same direction as that of the Jet and deflects through an angle of 170° the vanes move in the same direction as that of Jet with a velocity of 30 m/sec. If the water flow ratio is 180 liters/sec, determine the component of forces on the vane. Find the power developed and vane efficiency. [12M]

UNIT-III

5. a) Differentiate between Francis turbine and Kaplan turbine mentioning the principle of working advantages and applications. [5M]
- b) A Kaplan turbine is designed to develop 20 MW under a head of 25 m and a speed of 150rpm. The hydraulic efficiency is 95 %. Overall efficiency is 85 % and outer diameter is 5 m. and diameter of hub is 2 m. Determine runner vane angles at the hub and at the outer periphery. Assume that the turbine discharges without whirl at exit. [7M]

(OR)

6. a) Discuss the characteristic curves of Hydraulic turbines. [6M]
- b) Discuss the significance of unit quantities and specific quantities [6M]

UNIT-IV

7. a) Discuss the phenomenon behind pouring of water in centrifugal pump. [5M]
b) A centrifugal pump having outer diameter equal to two times the inner diameter and running at 1000 rpm works against a total head of 40 m. The velocity of flow through the impeller is constant and equal to 2.5 m/s. The vanes are set back at an angle of 40° at outlet. If the outlet diameter of the impeller is 500 mm and width at outlet is 50 mm, determine: i) vane angle at inlet, ii) work done by impeller on water per second, and iii) Manometric efficiency. [7M]

(OR)

8. What is the need for multi staging of Centrifugal pumps? Describe the working of multi stage pump with a) impellers in parallel b) impellers in series [12M]

UNIT-V

9. a) Obtain a relationship for the torque τ to rotate a disk of diameter D in a fluid of viscosity μ at an angular speed ω over a plate, with clearance h . [8M]
b) Distinguish between Reynolds number and Froude number. [4M]

(OR)

10. a) A water tunnel operates with a velocity of 3m/s at the test section and power required was 3.75 kW. If the tunnel is to operate with air, determine for similitude the flow velocity and the power required. Take $\rho_a = 1.25 \text{ kg/m}^3$, $\gamma_a = 14.8 \times 10^{-6} \text{ m}^2/\text{s}$, $\gamma_w = 1.14 \times 10^{-6} \text{ m}^2/\text{s}$. [6M]
b) The frictional torque T of a disc of diameter D rotating at a speed of N in a fluid of viscosity μ and density ρ in a turbulent flow is given by $T = D^5 N^2 \rho \phi(\mu/D^2 N \rho)$. [6M]

Answer ONE Question from each Unit

All Questions Carry Equal Marks

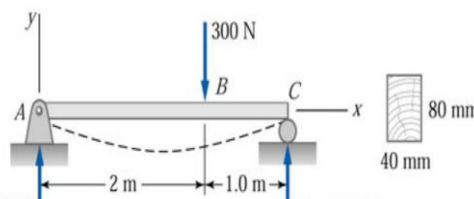
All parts of the Question must be answered at one place

UNIT-I

1. A cantilever beam of length 6m carries a uniformly distributed load of intensity 10kN/m over its entire length. Find the slope and deflection at the free end. Take $E = 200 \times 10^6$ kN/m² and Moment of inertia (I) = 30×10^{-5} m⁴. 14

(OR)

2. The simply supported wood beam ABC in Fig. has the rectangular cross section shown. The beam supports a concentrated load of 300 N located 2 m from the left support. Determine the maximum displacement and maximum slope angle of the beam. Use $E = 12$ GPa for the modulus of elasticity. Neglect the weight of the beam. 14



UNIT-II

3. a) The principal stresses at a point in a piece of steel are 80 MPa compressive and 60 MPa tensile. Find the intensity and direction of the stress across a plane the normal of which is inclined at 45° to the axis of the 80 MPa principal stress, the plane being also perpendicular to the plane of zero stress. 7
- b) A steel bar is 8 m long and 80 mm x 30 mm in section. It is subjected to an axial pull of 150 kN. Determine the intensities of normal and tangential stresses on a plane section inclined at 30° to the longitudinal axis. 7
- (OR)
4. a) Derive an expression for a body subjected to shear stress in one plane. 7
- b) At a point within a body subjected to two mutually perpendicular directions the stresses are 100N/mm² tensile and 70N/mm² compressive. Determine the normal, shear and resultant stresses on an oblique plane inclined at an angle of 30° with the axis of minor tensile stress. 7

UNIT-III

5. A shell 4.5m long, 1m in diameter is subjected to an internal pressure of 1.5N/mm^2 . If thickness of the shell is 12mm, find the circumferential and longitudinal stresses. And also find the maximum shear stress and the changes in the dimensions of the shell. Take $E = 2.1 \times 10^5 \text{ N/mm}^2$ and poisson's ratio=0.35. 14
- (OR)**
6. A cylinder air receiver for a compressor is 3.2m in internal diameter and made of plates 12mm thick. If the hoop stress is not to exceed 60 N/mm^2 and the axial stress is not to exceed 40 N/mm^2 , find the maximum safe air pressure. 14

UNIT-IV

7. List the assumptions made in Euler's theory of buckling? Derive an expression for the Euler's buckling load for a column hinged at both ends? 14
- (OR)**
8. A solid round bar 3.5 m and 70 mm diameter is used as a strut. Determine the crippling load for the below cases. Take $E = 2.1 \times 10^5 \text{ N/mm}^2$. 14
1. When both ends fixed
 2. When both ends hinged
 3. One end is fixed and other end free

UNIT-V

9. What are the stresses acting retaining wall due to direct loading? What are the stability conditions should be checked for retaining walls? 14
- (OR)**
10. State the stresses under combined action of direct loading an also draw bending moment at a section on chimney. What are the stability conditions should be checked for chimney. 14