Register No : _____

THE KAVERY ENGINEERING COLLEGE

(An Autonomous Institution)

B.E/B.TECH DEGREE END SEMESTER THEORY EXAMINATIONS, NOV /DEC 2024

Third Semester

Chemical Engineering

CH3302 – Mechanics of Solids

Regulations - 2021

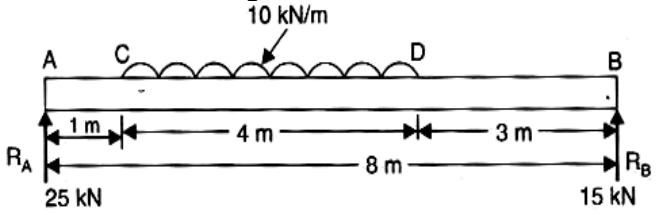
Duration : 3 Hrs *Maximum: 100 Marks*

*PART – A (ANSWER ALL QUESTIONS) (Marks 10*2=20)*

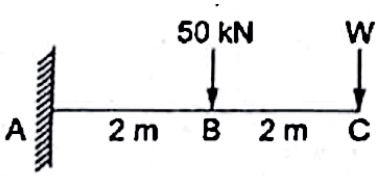
Q.No	*Questions*	*BLT*	*CO*	*Marks*
1.	State Hooke's Law.	RE	1	2
2.	Write an expression of volumetric strain.	RE	1	2
3.	List out the types of load acting on a beam.	RE	2	2
4.	Draw the shape of the bending moment diagram for a simply supported beam carrying a concentrated load at centre.	UN	2	2
5.	State the two theorems in moment area method.	UN	3	2
6.	Tell when Macaulay's method is preferred.	RE	3	2
7.	How does the flitched beam configuration improve the load-carrying capacity of a wooden beam?	UN	4	2
8.	List the applications and uses of leaf springs.	UN	4	2
9.	Why hollow circular shafts are preferred over solid circular shafts?	RE	5	2
10.	Differentiate between closed coil helical spring and open coil helical spring.	UN	5	2

*PART – B (ANSWER ALL QUESTIONS) (Marks 5*13 = 65)*

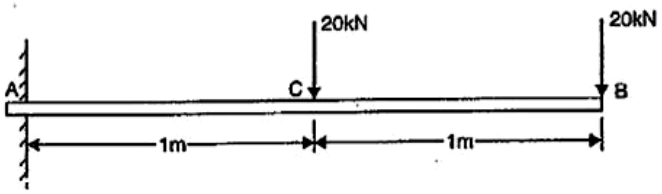
Q.No		*Questions*	*BLT*	*CO*	*Marks*
11.	a	A bar of 25 mm diameter is subjected to a pull of 40 kN. The measured extension on gauge length of 200 mm is 0.085 mm and the change in diameter is 0.003 mm. Estimate the values of Poisson's ratio and the three moduli.	AP	1	13
		Or			
	b	A compound bar of length 600 mm consists of a strip of aluminium 40 mm wide and 20 mm thick and a strip of steel 60 mm wide × 15 mm thick rigidly joined at the ends. If elastic modulus of aluminium and steel are 1×10^5 N/mm^2 and 2×10^5 N/mm^2. Determine the stresses developed in each material and the extension of the compound bar when axial tensile force of 60 kN acts.	AP	1	13
12.	a	Draw the shear force and bending moment diagrams for a simply supported beam of length 8 m and carrying a uniformly distributed load of 10 kN/m for a distance of 4 m as shown in fig.	AP	2	13



Or

	b	Find the dimensions of a timber joist span 5 m to carry a brick wall 200 mm thick and 3.2 m high, if the weight of brickwork is 19 kN/m³ and the maximum stress is limited to 8 N/mm². The depth is to be twice the width.	AP	2	13
13.	a	A cantilever beam 4 m long carries a load of 50 kN at a distance of 2 m from the free end and a load of W at the free end. If the deflection at the free end is 25 mm, calculate the magnitude of the load W, and the slope at the free end. E=200 kN/mm², I=5×10⁷ mm⁴. 	AP	3	13
		Or			
	b	A beam of length 6 m is simply supported at its ends and carries two point loads of 48 kN and 40 kN at a distance of 1 m and 3 m respectively from the left end support. Find the deflection under each load. Take E= 2 x 10⁵ N/mm² and I = 85 x 10⁶ N/mm⁴.	AP	3	13
14.	a	Derive the bending equation $\frac{M}{I}=\frac{F}{Y}=\frac{E}{R}$ and write the limitations of the assumptions made in the theory of simple bending?	UN	4	13
		Or			
	b	A flitched beam consists of two timber joist 100mm wide and 240 mm deep with a steel plate 180 mm deep and 10mm thick placed symmetrically between the timber joists and well clamped. Formulate (i) The maximum fibre stress when the maximum fibre stress in wood is 80 kg/cm² (ii) The combined moment of resistance if the modular ratio is 18	AP	4	13
15.	a	A solid circular shaft transmits 75 kW power at 200 rpm. Estimate the values of shaft diameter, if the twist in the shaft is not to exceed one degree in 2 m length of shaft and shear stress is not exceed 50 N/mm². Assume the modulus of rigidity of the material of the shaft as 100 kN/mm².	AP	5	13
		Or			
	b	A close coiled helical spring has a stiffness of 5 N/mm its length when fully compressed with adjacent coils touching each other is 40 cm. The modulus of rigidity of the material of the spring is 8x10⁴ N/mm². Determine the wire diameter and mean coil diameter if their ratio is 1/10. What is the corresponding maximum shear stress in the spring.	AP	5	13

*PART – C (Marks 1*15 = 15)*

Q.No		*Questions*	*BLT*	*CO*	*Marks*
16.	a	Using moment area method, find out the deflection of the beam shown below. Take I = $85x10^5$ mm^4, E = $2x10^5$ N/mm^2. 	AP	3	15
		Or			
	b	Derive the Torsional equation $\frac{T}{J} = \frac{F_S}{R} = \frac{C\theta}{L}$ and mention the assumptions made in deriving the torsional formulas.	AP	5	15