Register No : _____

THE KAVERY ENGINEERING COLLEGE

(An Autonomous Institution)

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

Fourth Semester

Mechanical Engineering

CE3491–Strength of Materials

Regulations - 2021

Duration : 3 Hrs *Maximum : 100 Marks*

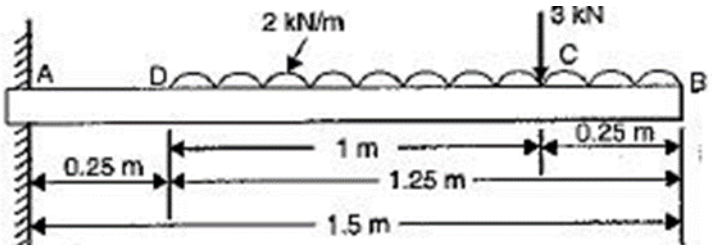
*PART – A (ANSWER ALL QUESTIONS) (Marks 10*2=20)*

Q.No	*Questions*	*BLT*	*CO*	*Marks*
1.	Write down the S.I. units of stress and strain.	UN	1	2
2.	Define the term modulus of rigidity.	RE	1	2
3.	Draw bending moment diagram for a simply supported beam carrying a point load at the centre.	UN	2	2
4.	Write down the bending equation.	RE	2	2
5.	Write down the S.I. units of torsional shear stress and shear strain.	UN	3	2
6.	What is the difference between open and closed coiled springs?	UN	3	2
7.	Write the formula for deflection of a simply supported beam carrying Uniformly Distributed Load (UDL) throughout its length.	RE	4	2
8.	Define the term deflection of a beam.	RE	4	2
9.	When do you call a cylinder as thin cylinder?	UN	5	2
10.	Define longitudinal stress.	RE	5	2

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

Q.No		*Questions*	*BLT*	*CO*	*Marks*
11.	a	A tensile test was conducted on a mild steel bar. The following data was obtained from the test: i. Diameter of the steel bar = 3 cm ii. Gauge length of the bar = 20 cm iii. Load at elastic limit = 250 kN iv. Extension at a load of 150 kN = 0.21 mm v. Maximum load = 380 kN vi. Total extension = 60 mm vii. Diameter of the rod at the failure = 2.25 cm Determine: (a) The Young's modulus (b) The stress at the elastic limit (c) The percentage elongation, and (d) The percentage decrease in area.	AP	1	13
		Or			
	b	A load of 1.9 MN is applied on a short concrete column 300 mm x 200 mm. The column is reinforced with four steel bars of 10 mm diameter, one in each corner. Find the stresses in the concrete and steel bars. Take E for steel as 2.1×10^5 N/mm^2 and for concrete as 1.4×10^4 N/mm^2.	AP	1	13

12.	a	A cantilever beam of 1.5 m length is subjected to loads as shown in the below diagram. Draw the shear force and bending moment diagram.	AP	2	13



Or

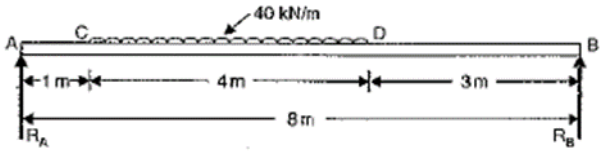
	b	Derive the bending equation of beam.	AP	2	13
13.	a	A solid cylindrical shaft is to transmit 300 kW power at 100 rpm. (a) If the shear stress is not to exceed 80 N/mm^2, find its diameter. (b). What percent saving in weight would be obtained if the shaft is replaced by a hollow one whose internal diameter equals to 0.6 of the external diameter, the length, the material and maximum shear stress being the same?	AP	3	13

Or

	b	Determine the diameter of a solid steel shaft which transmits 90 kW at 160 rpm. Also determine the length of the shaft if the twist must not exceed 1° over the entire length. The maximum shear stress is limited to 60 N/mm^2. Take the value of modulus of rigidity = 8 x 10^4 N/mm^2.	AP	3	13
14.	a	Determine the slope and deflection of a cantilever beam subjected to Uniformly distributed length throughout it's length by double integration method.	AP	4	13

Or

	b	A beam of length 8 m is simply supported at its ends. It carries a uniformly distributed load of 40 kN/m as shown in the diagram. Take E=2x 10^5 N/mm^2 and I = 4.3 x 10^8 mm^4. Determine the deflection of the beam at its mid-point. Also determine the position and magnitude of maximum deflection.	AP	4	13



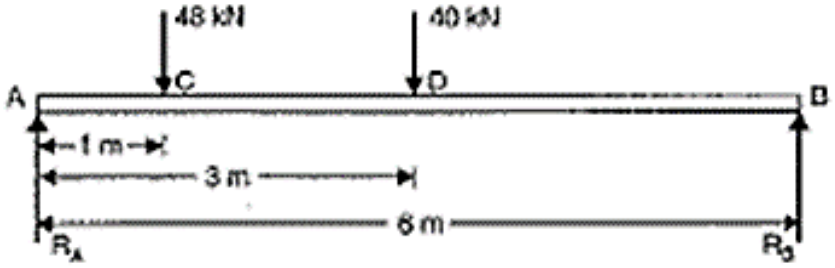
15.	a	A water main 90 cm diameter contains water at a pressure head of 110 m. If the weight density of water is 9810 N/mm^2, find the thickness of the metal required for the water main. Given the permissible stress as 22 N/mm^2.	AP	5	13

Or

	b	Determine the maximum and minimum hoop stress across the section of pipe of 400 mm internal diameter and 100 mm thick, when the pipe contains a fluid at a pressure of 8 N/mm^2. Also sketch the radial pressure distribution and hoop stress distribution across the section.	AP	5	13

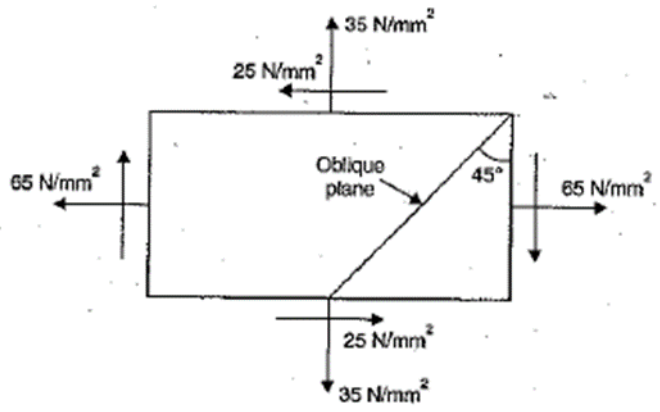
*PART – C (Marks 1*15 = 15)*

Q.No		*Questions*	*BLT*	*CO*	*Marks*
16.	a	A beam of length 6m length carries two-point loads as shown in the diagram. Take E = 2 x 10^5 N/mm^2 and I = 85 x 10^6 mm^4. Determine the deflection at each load. Also determine the position and magnitude of maximum deflection.	AP	4	15



Or

	b	A rectangular block is subjected to stresses as shown in the below diagram.	AP	1	15



Determine the normal and tangential stress in the oblique plane.