U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

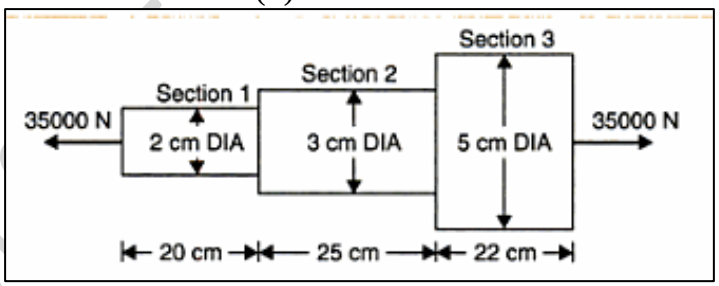
Autonomous Institute Affiliated to VTU

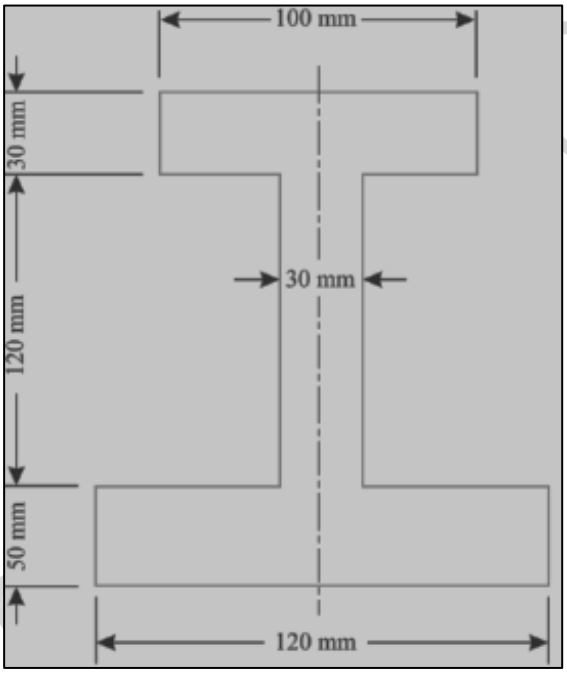
April 2024 Semester End Main Examinations

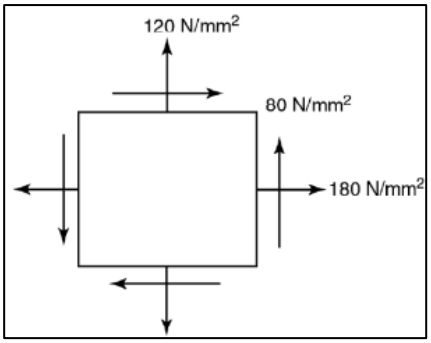
Programme: B.E. **Semester: III**
Branch: Civil Engineering **Duration: 3 hrs.**
Course Code: 23CV3PCSOM / 22CV3PCSOM **Max Marks: 100**
Course: Strength of Materials

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

			UNIT - I	CO	PO	Marks
1	a)		Explain the terms – (i). Poisson's ratio (ii). Rigidity Modulus (iii). Modulus of Elasticity (iv). Factor of safety	CO 1	PO1, PO2	08
	b)		Find the Young's modulus of a Brass rod of diameter 25 mm and a length of 250 mm subjected to a tensile load of 50 kN when the extension of the rod is equal to 0.3 mm.	CO 1	PO1, PO2	04
	c)		A rod is 2m long at a temperature of 10°C. Find the expansion of the rod, when the temperature is raised to 80°C. If the expansion is prevented, find the stress induced in the material of the rod. Take E = 1.0×10^5 MN/m^2 and $\alpha = 0.000012$/°C.	CO 1	PO1, PO2	08
			OR			
2	a)		An axial pull of 35000 N is acting on a bar consisting of three lengths as shown in the fig. Q 2(a).If Young's modulus is 2.1×10^5 N/mm^2, determine the following : (i) stress in each section (ii)total extension of the bar  Fig. Q 2(a)	CO 1	PO1, PO2	12
	b)		A bar of 30mm diameter is subjected to a pull of 60 kN. The measured extension on gauge length of 200 mm is 0.1mm and change in diameter is 0.004mm. Calculate – (i)Young's modulus (ii) Poisson's ratio (iii) Bulk modulus	CO 1	PO1, PO2	08
			UNIT – II			
3	a)		A simply supported beam of span 'L' is subjected to a distributed load varying uniformly from '0' at left support to 'w' KN/m at the right support Draw the BMD & SFD indicating salient values.	CO 2	PO1, PO2	08

		b)	A determinate beam 6m long is supported at two points, one at its extreme left end and the other at 2m from extreme right end. The beam carries an UDL of 2 KN/m over its entire length. A point load of 2 KN also acts its extreme right end. Draw the shear force and bending moment diagrams for the beam. Locate all the salient points.	***CO*** 2	***PO1, PO2***	**12**
			UNIT - III			
	4	a)	List the assumptions made in the simple bending theory.	***CO*** 2	***PO1, PO2***	**03**
		b)	Prove that in case of a beam of a rectangular cross-section, the maximum shear stress developed is 1.5 times the average shear stress.	***CO*** 2	***PO1, PO2***	**05**
		c)	A simply supported beam of span 8m has cross-section as shown in the fig. Q. 4(c). If the maximum permissible bending stress in tension is limited to 30 MN/m^2 and in compression is 45 MN/m^2 find the intensity of UDL the beam can carry over its entire span. Also calculate the maximum bending stresses set up in the section.  Fig.Q.4(c)	***CO*** 2	***PO1, PO2***	**12**
			UNIT - IV			
	5	a)	Explain Mohr's circle of stress and its uses.	***CO*** 1	***PO1, PO2***	**04**
		b)	A rectangular bar of cross-sectional area 10,000mm^2 is subjected to an axial load of 20kN. Determine the normal and shear stresses on a section which is inclined at an angle 30° measured counter clock wise from the normal cross-section of the bar.	***CO*** 1	***PO1, PO2***	**06**

		c)	The state of stress at a point in a strained material is as shown in the fig. Q. 5 (c). Determine the following – (i). The direction of the principal planes, (ii). The magnitude of principal stresses, (iii). The magnitude of maximum shear stress and its direction. Indicate all the above in the element.  Fig.Q.5(c)	***CO*** 1	***PO1, PO2***	**10**
			UNIT - V			
	6	a)	State the assumptions made in the Euler's column theory. Obtain the Euler's equation for crippling load of a long column with both the ends hinged.	***CO*** 2	***PO1, PO2***	**12**
		b)	A hollow mild steel tube 6m long, 4 cm internal diameter and 5 mm thick is used as a strut with both ends hinged. Find the Euler's crippling load and safe load taking factor of safety as 3.0 Take $E = 2 \times 10^5$ N/mm^2.	***CO*** 2	***PO1, PO2***	**08**
			OR			
	7	a)	Explain the following terms – (i). Pure torsion (ii). Polar modulus (iii). Torsional rigidity	***CO*** 2	***PO1, PO2***	**06**
		b)	In a hollow circular shaft of outer and inner diameters of 20 cm and 10 cm respectively, the shear stress is not to exceed 40 N/mm^2. Find the maximum torque which the shaft can safely transmit.	***CO*** 2	***PO1, PO2***	**04**
		c)	A hollow shaft is to transmit 300 kW power at 80 rpm. If the shear stress is not to exceed 60 N/mm^2 and internal diameter is 0.6 of the external diameter, find the external and internal diameters assuming that the maximum torque is1.4 times the mean torque.	***CO*** 2	***PO1, PO2***	**10**

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