PVP 20

Code: 20ME3402

II B.Tech - II Semester – Regular / Supplementary Examinations
MAY 2024

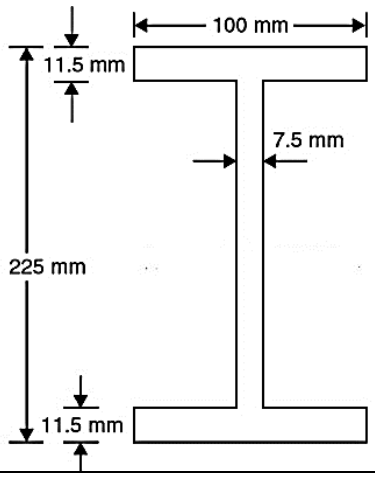
STRENGTH OF MATERIALS
(MECHANICAL ENGINEERING)

Duration: 3 hours Max. Marks: 70

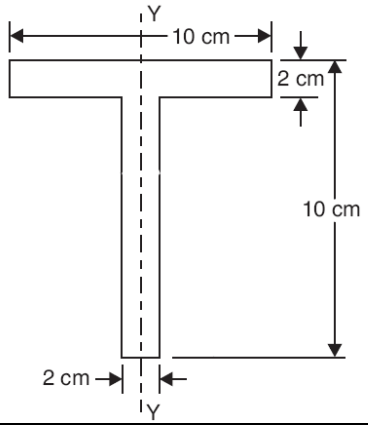
Note: 1. This paper contains questions from 5 units of Syllabus. Each unit carries 14 marks and have an internal choice of Questions.
2. All parts of Question must be answered in one place.

BL – Blooms Level CO – Course Outcome

			BL	CO	Max. Marks
UNIT-I					
1		A steel tube of 35mm outer diameter and 30mm inner diameter encloses a gunmetal rod of 25mm diameter and is rigidly joined at each end. If at a temperature of 40^0C there is no longitudinal stress, determine the stresses developed in the rod and the tube when the temperature of the assembly is raised to 240^0C. For steel $\alpha_s=11\times10^{-6}/^0$c, E_s=205GPa and for gun metal $\alpha_g=18\times10^{-6}/^0$c, E_g=91.5GPa. Also find the increase in length if the original length of the assembly is 1m.	L3	CO2	14 M
OR					
2	a)	What are the assumptions made in deriving the Torsion Equation?	L1	CO2	4 M
	b)	Determine the diameter of a solid shaft which will transmit 440 kW at 280 rpm. The angle of twist should not exceed one degree per metre length and the maximum torsional shear stress is to be limited to 40 N/mm^2. Assume G = 84kN/mm^2.	L3	CO2	10 M

		UNIT-II			
3	a)	Explain the importance of Shear force and Bending Moment diagrams.	L2	CO2	4 M
	b)	A cantilever beam of length 2 m carries uniformly distributed load of 1.5 kN/m run over the whole length and a point load of 2 kN at a distance of 0.5 m from free end. Draw the shear force and bending moment diagrams for the cantilever beam.	L3	CO2	10 M
		OR			
4		Draw the Shear Force and Bending Moment diagram for a simply supported beam of length 9m and carrying a uniformly distributed load 10kN/m for a distance of 6m from the left end. Also calculate the maximum bending moment on the section.	L3	CO2	14 M
		UNIT-III			
5	a)	What are the assumptions made in deriving the flexure formula?	L2	CO3	4 M
	b)	An I section shown in Fig. is simply supported over a span of 12 m. If the maximum permissible bending stress is 80 N/mm^2, what concentrated load can be carried at a distance of 4 m from one support? 	L4	CO3	10 M

		OR			
6	a)	Show that for a rectangular section of the maximum shear stress is 1.5 times the average stress.	L2	CO3	7 M
	b)	A rectangular beam 100 mm wide and 250 mm deep is subjected to a maximum shear force of 50 kN. Determine : i) Average shear stress, ii) Maximum shear stress, and iii) Shear stress at a distance of 25 mm above the neutral axis	L4	CO3	7 M
		UNIT-IV			
7		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 support. Find i. Deflection under each load, ii. Maximum deflection, and iii. The point at which maximum deflection occurs. Given $E = 2 \times 10^5$ N/mm^2 and $I = 85 \times 10^6$ mm^4.	L4	CO3	14 M
		OR			
8	a)	Derive an expression for hoop stress in a thin cylinder with ends closed by rigid flanges and subjected to an internal fluid pressure ‘p’. Take the internal diameter and shell thickness of the cylinder to be ‘d’ and ‘t’ respectively.	L4	CO3	4 M
	b)	Calculate: (i) The change in diameter (ii) The change in length and (iii) Change in volume of a thin cylindrical shell 100 cm diameter, 1 cm in thick and 5m long when subjected to internal pressure of 3 N/mm^2. Take the value of $E=2\times10^5$N/mm^2 and poisons ratio=0.3.	L4	CO3	10 M

	UNIT-V			
9	Derive expressions for major and minor principal stresses on an oblique plane, when the body is subjected to direct stresses in two mutually perpendicular directions accompanied by a shear stress.	L4	CO4	14 M
	OR			
10	Determine the crippling load for a T-section of dimensions 10cm×10cm×2cm and of length 5m when it is used as a strut with both of its ends hinged. Take Young's modulus E = 2×10^5 N/mm^2.  	L4	CO4	14 M