JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATIONS- 2026

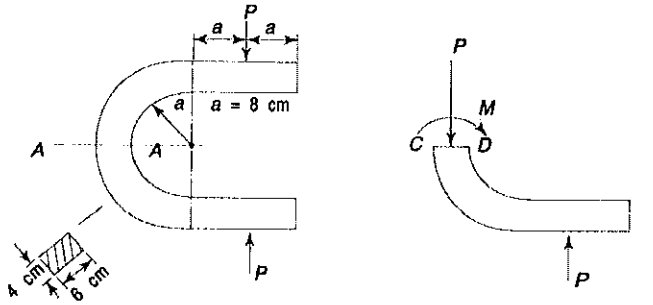
M.Tech - II Semester (SE)

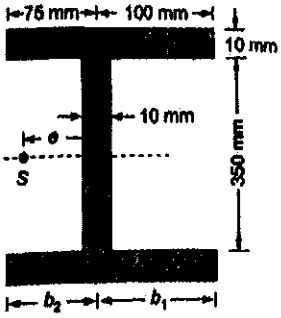
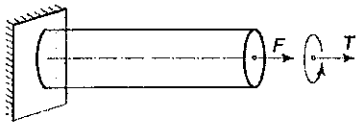
COURSE CODE (CREDITS): 25M11CE211[3] MAX MARKS: 35

COURSE NAME: Solid Mechanics in Structural Engineering

COURSE INSTRUCTOR: Dr. Tanmay Gupta MAX. TIME: 2 Hours

Note: (a) All questions are compulsory. (b) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems (c) Use of calculator is allowed

Q.No	Question	CO	Marks
Q1	Explain with a neat diagram bending of curved beams, give step by step derivation for Winkler Bach formula for rectangular section? (a) Determine the maximum tensile and maximum compressive stresses across the Sec. AA of the member loaded, as shown in Figure below where Load P = 19620N 	3	8
Q2	What do you understand by axisymmetric problems? Using cylindrical coordinates, show state of stress on an axisymmetric radial element with neat diagram. (b) Considering thick-walled cylinder subjected to Internal and external pressures – lame's problem, show the state of stress with analytical expression and diagram. (a) Select the outer radius b for a cylinder subjected to an internal pressure p_i = 500 atm with a factor of safety 2. The yield point for the material (in tension as well as in compression) is σ_{yp} = 490000 kPa. The inner radius is 5 cm. Assume that the ends of the cylinder are closed.	4	10
Q3	Explain the concept of shear center in the context of unsymmetrical cross-sections under bending. How does the location of the shear center affect the structural behavior of thin-walled open sections? (a) For the given unsymmetrical I section find the position of shear center, b_2 = 75mm, b_1 = 100mm, t_1 =10mm, h = 360mm	3	6

			
Q4	Determine the diameter of a ductile steel bar if the tensile load F is 35,000 N and the torsional moment T is 1800 Nm. Use a factor of safety N = 1.5. E = 207 X 10^6 kPa, and σ_{yp} is 207,000 kPa. Use the maximum shear stress theory. 	5	5
Q5	(a) The total strain energy density is decomposed into two parts. What are they, and which one is responsible for a material "failing" versus just "shrinking"? (b) In a "Plane Strain" state (common in dams), we say . However, it is pointed out that the stress in that direction is NOT zero. Why? (c) Explain the physical significance of the three Stress Invariants (I_1, I_2, I_3).	1,2,3	6