R5

II B.Tech I Semester(R05) Supplementary Examinations, May/June 2010
MECHANICS OF SOLIDS
(Mechanical Engineering)

Time: 3 hours   Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks
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1. A steel rod 28 mm diameter is fixed concentrically in a brass tube of 42 mm outer diameter and 30 mm inner diameter. Both the rod and tube are 450 mm long. The compound rod is held between two stops which are exactly 450 mm apart and the temperature of the bar is raised by 70^0C.

    (a) Find the stresses in the rod and tube if the distance between the stops is increased by 0.30 mm.

    (b) Find the increase in the distance between the stops if the force exerted between them is 90 kN

    Take $E_S = 200kN/mm^2$; $\alpha_S = 11.2 \times 10^{-6} per^0$C
    $E_b = 90kN/mm^2$; $\alpha_b = 2.1 \times 10^{-5} per^0$C   [16]

2. (a) How do you classify loads? Give examples.   [4]

    (b) A simply supported beam of length 5m carries a uniformly increasing load of 800 N/m run at one end to 1600 N/m run at the other end. Draw the S.F. and B.M. diagrams for the beam.   [12]

3. (a) State the assumptions involved in the theory of simple bending.   [6]

    (b) Derive the Bending equation from fist principle.   [10]

4. (a) Sketch the variation of shear stress across the depth of the beam of the following cross sections.
        i. T - section and   [3]
        ii. Sequence section with diagonal vertical.   [3]
        iii. Circular section.   [3]

    (b) An I section is having overall depth as 550mm and overall width as 200mm. The thickness of the flanges is 25mm where as the thickness of the web is 20mm. If the section carries a shear force of 45kN, calculate the shear stress values at salient points and draw the sketch showing variation of shear stress.

                                                                                                    [7]

5. (a) What is degree of in determinancy in trusses? Explain with examples?

    (b) Explain method of tension coefficients, and explain why it is preferred to analyse the trusses ?
        [8+8]

6. (a) What is moment area method? Explain the two Mohr's theorems, as applicable to the slope and deflection of a beam.   [6]

    (b) A cantilever of uniform cross-section of length l carries two point loads, W at the free end and 2W at a distance a from the free end. Find the maximum deflection due to this loading.   [10]

7. (a) Define pressure vessel and discuss the most important considerations while designing pressure vessel.   [6]

    (b) A boiler shell is made of 15 mm thick plate having a limiting tensile stress of 125 N/mm^2. If the longitudinal and circumferential efficiencies are 70% and 60% respectively, determine the maximum diameter of the shell. The allowable maximum pressure is 2.2 N/mm^2.   [10]

8. A C.I pipe of 200mm internal dia. And thickness of metal 50mm carries water under a pressure of $7N/mm^2$. Find the max. and minimum intensities of hoop stress, sketch the Variation of hoop stress and radial pressure across the section.

                                                                                                    [16]

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