PVP 12

Code: CE3T3

II B.Tech - I Semester – Regular Examinations - January 2014

MECHANICS OF SOLIDS - I
(CIVIL ENGINEERING)

Duration: 3 hours Marks: 5x14=70

Answer any FIVE questions. All questions carry equal marks

1. a) Draw a neat sketch of stress strain diagram for mild steel indicating the salient points on the curve 6 M

   b) A copper bar 1.5 m long is at a temperature of 30^0 c. Find the extension of the rod when its temperature is raised to 80^0c. Determine the stress in the bar if the expansion of the bar is prevented. Assume E = 120 GPa and $\alpha = 18 \times 10^{-6}$ per ^{0}k 8 M

2. a) Show that the stress induced in a bar due to suddenly applied loading is twice when compared to gradual applied loading. 6 M

   b) A mass 25 kg is dropped on to a collar at the end of a vertical bar 2 m long and 25 mm in diameter, from a height of 120 mm. Calculate the maximum instantaneous stress and extension produced in the section of the bar. Assume the Young's Modulus of the material E as 2×10^5 N/mm^2. 8 M

3. a) Derive the relation between Shear Force and Bending Moment for a beam. 6 M

b) A Simply Supported beam of length 8 m carries a udl of 36 kN/m over the entire span. The beam is provided with a rigid prop at the centre of span and the prop reaction is 180 kN. Sketch the Shear Force Diagram and Bending Moment Diagram for the beam indicating the salient points on the curves. 8 M

4. a) What are the assumptions made in the derivation of bending equation? Derive the flexural formula based on theory of pure bending. 8 M

b) Show that the bending strength of a square section is 1.414 times when the cross section of the square beam is placed with one of the diagonal as horizontal. 6 M

5. a) Show that the maximum shear stress induced in a beam of circular cross section is 4/3 times of average shear stress in the cross section. 6 M

b) Construct the shear stress diagram for a symmetrical I-Section subjected to a shear force of S and having an overall depth of 600 mm. The width of the flange is 150 mm. The thicknesses of flange and web are 20 mm and 10 mm respectively. 8 M

6. a) What are the assumptions made in the derivation of Torsion equation? 6 M

b) A hollow shaft of external diameter 120 mm transmits a power of 240 kW at 200 r.p.m. Determine the maximum internal diameter if the maximum stress in the shaft is not to exceed 60 MPa. 8 M

7. A simply supported beam of span 8 m carrying two point loads 90 kN, 60 kN at a distance of 2 m and 5 m respectively from the left end. Calculate the deflection under each load and the maximum deflection. Assume the value of Young's modulus as 2×10^5 N/mm^2 and Moment of Inertia of the beam as 120×10^6 mm^4. 14 M

8. a) Define principal stress and Principal plane. 4 M

b) At a point in a material the tensile stress and compressive stresses in two mutually perpendicular planes are 90 MPa and 40MPa respectively along with a shear stress of 20 MPa. Calculate the Principal stresses and the magnitude of maximum shear stress. Determine the normal stress and shear stress on a plane inclined at 15^0 with the plane on which 90 Mpa tensile stresses is acting. 10 M