Hall Ticket No | | | | | | | | | | | Question Paper Code: BCC206

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

M.Tech I Semester End Examinations (Supplementary) - May, 2019

Regulation: IARE–R16

ADVANCED MECHANICS OF SOLIDS
(CAD/CAM)

Time: 3 Hours **Max Marks: 70**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT – I

1. (a) Explain equations of equilibrium, stress strain relations and neutral axis for bending in beams subjected to non-symmetrical bending. **[7M]**

   (b) A beam of length 5 m and of uniform rectangular section is supported at its ends and carries uniformly distributed load over the entire length, calculate the depth of the section if the maximum permissible bending stress is 8 N/mm^2 and central deflection is not to exceed 10 mm. Take the value of E = 1.2 x 104 N/mm^2. **[7M]**

2. (a) To find out the deflection of straight beams subject to a non-symmetrically loaded beam.

   (b) For a simply supported beam of length 5 m, which is carrying a point load of 5 kN at a distance of 3 m from the left end. Determine **[7M]**

   i. Slope at the left support,
   ii. Deflection under the load
   iii. Maximum deflection Take E = 2x 105 N/mm^2 and I = 1 x 108mm^4

UNIT – II

3. (a) Define curved beam theory. Explain in detail with I section radial stresses. **[7M]**

   (b) Determine the stress at point D of a hook having a trapezoidal section with following dimensions shown in Figure 1: b_1= 4 cm, b_2 = 1 cm, r_1= 3 cm, r_2 = 10 cm, h = 7 cm, force P = 29400 N. **[7M]**

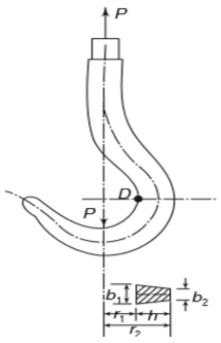

Figure 1

4. (a) Explain statistically indeterminate curved beams for a closed ring subjected to a concentrated load. **[7M]**

   (b) Deduce an equation for the value of p^2 of a trapezoidal section. **[7M]**

UNIT – III

5. (a) Define winkler batch for circumferential stress. Deduce an equation for the torque transmitted by thin tubular section. **[7M]**

   (b) The two tubular sections shown in Figure 2 have the same wall thickness t and same circumference. Neglecting stress concentration, find the ratio of the shear stresses for **7M]**

   i. Equal twisting moments in the two cases

   ii. Equal angles of twist in the two cases

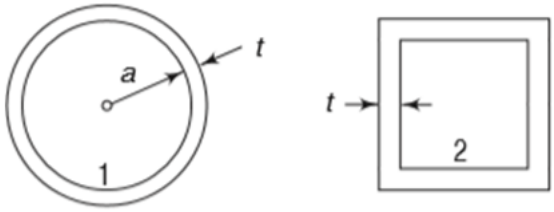

Figure 2

6. (a) Explain the term narrow rectangular cross section torsion member with a neat sketch. **[4M]**

   (b) A thin walled rectangular tube $30 \times 60mm$ is subjected to torque of 10Nm.The thickness of all wall is 2mm.Determine the angle of twist per metre.Take G=80GPa **[4M]**

UNIT – IV

7. (a) Explain the stress resultants in a flat plate with a neat sketch and pure bending of plates. **[7M]**

   (b) A square door has a side of 1.8m and thickness 15mm. The plate is simply supported and subjected to uniform pressure. Determine the yield pressure.E = 200 GPa, and v = 0.29 **[7M]**

8. (a) Explain briefly about the semiinfinite beam subjected to loads near its ends with a neat sketch. **[7M]**

   (b) A plate made of mild steel (E = 200 GPa, v = 0.29, and Yield stress= 315 MPa) has a thickness h = 10 mm and cover a circular opening having a diameter of 200 mm. The plate is fixed at the edges and is subjected to a uniform pressure p. **[7M]**

i. Determine the magnitude of the yield pressure P_y and deflection w_{max} at the centre of the plate when this pressure is applied.

ii. Determine a working pressure based on a factor of safety of SF = 2.00 relative to P_y

UNIT – V

9. (a) Define contact stresses. Explain the method of computing contact stresses briefly. **[7M]**

   (b) A 20 mm long cast iron rod of 25 mm diameter is pressed on to a thick copper plate with a force of 20N. Determine the width of the contact area, the maximum pressure at the centre of the contact area. The elastic constants for the materials are Cast iron E = 41.4 GPa, v = 0.211, Copper E = 44.7 GPa, v = 0.326 **[7M]**

10. (a) Explain about the stress for two bodies in line contact for the bodies normal to contact area. **[7M]**

    (b) Carbon steel balls, each 25 mm in diameter is pressed by a flat carbon plate force F= 18N at the centre of the area of contact. For carbon steel E = 207 GPa , and v = 0.292 **[7M]**

    i. Determine the values of the principal stresses

    ii. Determine the maximum shear stress. At what distance from the contact surface do they occur.