Code No: 53016

R09

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech II Year I Semester Examinations, March - 2017
MECHANICS OF SOLIDS
(Common to ME, MCT, AE, AME)

Time: 3 hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks
- - -

1.a) How to consider the self weight of the tapered for the estimation of the stresses developed? Derive the corresponding equation.

b) A rectangular block of size 50 mm × 100 mm × 80 mm is subjected to the following axial loads:
i) 500 kN (tensile) on 100 mm × 80 mm faces;
ii) 900 kN (tensile) on 500 mm × 80 mm faces;
iii) 1000 kN (Compressive) on 500 mm × 100 mm faces.
Taking the poison's ratio as 0.3, find the change in volume of the block. If E = 200 GPa, find the modulus of rigidity and the bulk modulus. [7+8]

2.a) How do you interrelate the shear force and bending moment across the section of the beam? Explain.

b) A beam of span 8.0m is rested over two simple supports at two ends. The beam is carrying U.D.L of intensity 2.0kN/m up to 4.0m length from left end. A concentrated load of 5.0 kN at a distance of 6.0m is applied on the beam. In addition to these loads the beam is also subjected to couples 20.0kNm anticlockwise at left end and 30.0kNm clockwise at right end respectively. Draw Shear force and bending moment diagram showing important values. Also find point of contraflexure in the beam. [7+8]

3.a) What are the assumption made in deriving the bending moment equation and derive the equation.

b) Compute the distance between the channel sections of 6.5 mm uniform thickness shown in figure 1, so that the principal Moment of Inertia of the combined section are equal. [7+8]

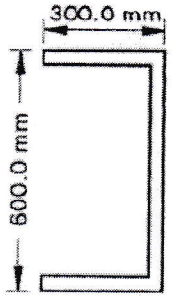

Figure: 1

4. A simply supported beam 4 m long has the cross section shown in Figure 2. Determine the maximum uniformly distributed load which can be applied over the entire length of the beam if the shearing stress is limited to 1.2 MPa. [15]

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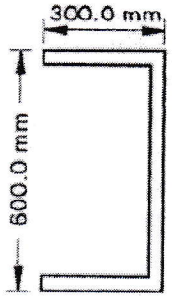

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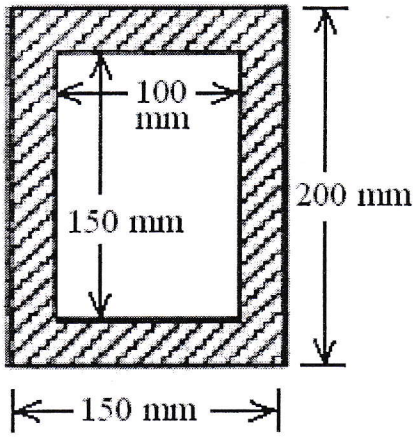

Figure: 2

5. Calculate the forces exerted in the truss structure shown in figure 3. [15]

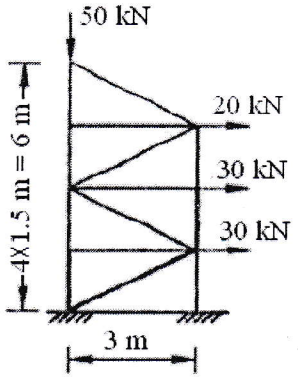

Figure: 3

6.a) Explain the double integration method for the estimation of slope and deflection for the beam with suitable example.

b) A beam 8 m long is simply supported at its ends and carries concentrated loads of 40 kN each at points 2 m from the ends. Calculate the maximum slope and deflection under each load. [7+8]

7.a) Develop the expressions for stresses in a thin cylinder subjected to internal pressure. Are these expressions valid for cylinders with external pressure?

b) A cylindrical shell 1.2 m long, 200 mm internal diameter and 10 mm thick is filled with a fluid at atmospheric pressure. If an additional 3×10^4 mm^3 of the fluid is pumped into the cylinder, find the pressure exerted by the fluid on the wall of the cylinder. Find also the hoop stress induced. Take $E = 2 \times 10^5$ N/mm^2, $\mu = 0.3$. [7+8]

8. The outer diameter of a cylinder is 1.4 times its inner diameter. Assuming $\nu = 0.30$, determine the ratio of external and internal pressures applied separately, so that in both the cases (a) the largest stresses have the same numerical values and (b) the largest strains have the same numerical values. [15]

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