B.Tech II Year I Semester (R09) Supplementary Examinations December 2015

MECHANICS OF SOLIDS

(Common to AE, ME & MCT)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks
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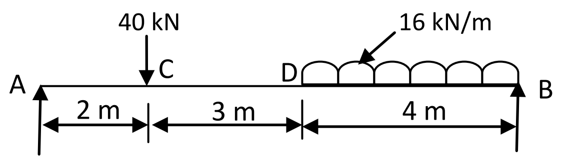
1 (a) Derive a relation between Young's modulus and Bulk modulus.
(b) A bar 30 mm in diameter was subjected to tensile load of 54 kN and the measured extension on 300 mm gauge length was 0.112 mm and change in diameter was 0.00366 mm. Determine the Poisson's ratio and value of three moduli.

2 A simply supported beam of 9 m span is loaded as shown in figure below. Draw the BMD and SFD indicating principal values.



3 A vertical flag staff standing 10 m above the ground is of square section throughout, the dimensions being 150 × 150 mm at the ground, tapering uniformly to 75 × 75 mm at the top. A horizontal pull of 350 N is applied at the top, the direction of loading being a diagonal of the section. Determine the maximum stress due to bending.

4 A steel of beam I–section 200 mm deep and 160 mm wide has 16 mm thick flanges and 10 mm thick web. The beam is subjected to a shear force of 200 kN. Determine the shear stress distribution over the beam section, if the web of the beam is kept horizontal.

5 (a) Write about assumptions made in theory of pure torsion.
(b) Determine a suitable diameter of solid shaft of circular section to transmit 112.5 kW of power at 200 r.p.m, if the allowable shear stress is 75 N/mm^3 and the allowable twist is 1° in a length of 3 m. Take N = 0.082 × 10^6 N/mm^2.

6 A uniform beam of length 4L is simply and symmetrically supported over a span of 2L. It carries a load W_1 at each end and a total uniformly distributed load of W_2 on the span between the supports. Find the ratio of W_1 to W_2, if the deflection at the mid span is equal to that at each end.

7 A copper tube of 50 mm internal diameter, 1 m long and 1.25 mm thick has closed ends and is filled with water under pressure. Neglecting distortion of end plates, determine the alteration of pressure when an additional volume of 3 m^3 of water is pumped in to the tube. Take E_C = 1.03 × 10^5 N/mm^2, 1/m = 0.3, k = 2.1 × 10^3 N/mm^2.

8 A compound cylinder formed by shrinking one tube on to another is subjected to an internal pressure of 60 N/mm^2. Before the fluid is admitted the internal and external diameter of the compound cylinder are 120 mm and 200 mm and the diameter at the junction is 160 mm. If after shrinking on the radial pressure at the common surface is 8 N/mm^2. Determine the final stresses setup by the section.

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