B.Tech II Year I Semester (R09) Supplementary Examinations June 2016

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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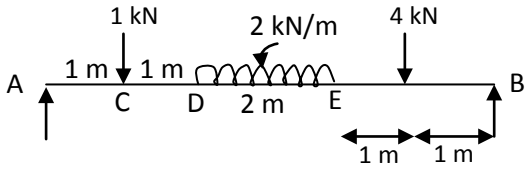
1 (a) Define Hooke's law and Poisson's ratio.

(b) A rigid bar is supported by three rods, the outer one of steel and the central one of copper. The cross sectional area of each steel rod is 300 mm^2 and of the copper rod is 1000 mm^2. The three rods are equally spaced and the loads of 50 kN are each applied midway between the rods. Determine the forces in each of the vertical bars if the rigid bar remains horizontal after the loads have been applied. Take E_s = 205 kN/mm^2 and E_g = 205 kN/mm^2.

2 A simple supported beam of span 6 m is loaded as shown in figure below. Draw SFD and BMD.



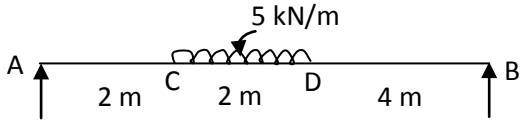
3 A $20 \times 10\ cm$ rolled steel joist of I-section has flanges 0.75 cm thick and web 0.55 cm thick. Find the safe uniformly distributed load that this section will carry over a span of 4 m if the permissible stress is limited to 140 N/mm^2.

4 The cross section of a joist is a fee-section $150\ mm \times 100\ mm \times 13\ mm$ with 150 mm side horizontal. Find the maximum intensity of shear stress and sketch the distribution of stress across the section if it has to resist a shear force of 80 kN.

5 (a) Derive a relation between twisting moment, twist and shear stress.

(b) A solid shaft has to transmit 90 kW power at 160 R.P.M. Find the suitable diameter for the shaft if the maximum torque transmitted in each revolution exceeds the mean by 25%. Take allowable shear stress as 70 N/mm^2.

6 A beam AB of span 8 m is loaded as shown in figure below. Determine deflection at mid span, maximum deflection and slope at end A. Take E = 2 x 10^5 N/mm^2, I = 8000 cm^4.



7 (a) Derive an equation for longitudinal stress in thin cylinder.

(b) A cylindrical shell is 3 m long, 1 m internal diameter and 15 mm thickness. Determine the maximum shear stress induced and also the changes in the dimensions of the shell if it is subjected to an internal pressure of 1.5 N/mm^2. Take E = 0.204 x 10^6 N/mm^2, and 1/m=0.3.

8 A C.I pipe has 20 cm internal diameter and 50 mm metal thickness and carries water under a pressure of 5 N/mm^2. Determine the maximum and minimum intensities of circumferential stress and sketch the distribution of circumferential stress intensity and the intensity of radial pressure across the section.

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