Code No: CE1503 **R14**

II B. Tech I Semester Regular Examinations, November 2015

MECHANICS OF SOLIDS - I

(Civil Engineering)

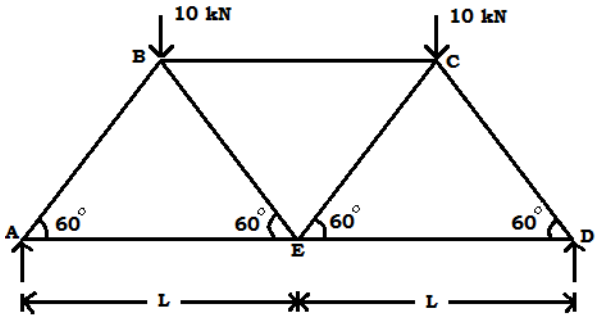
Time: 3 Hours **Max. Marks: 60**

Note: All Questions from **PART-A** are to be answered at one place.
Answer any FOUR questions from **Part-B.** All Questions carry equal Marks.

PART-A

6 x 2 = 12M

1. A steel rod of 2m long with uniform cross sectional area of 100 mm^2 is subjected to an axial pull of 50 kN. Calculate the stress and elongation produced in the rod. Take E for steel as 2×10^5 N/mm^2.
2. Define the terms "Poisson's ratio" and "Proof Resilience".
3. What is the u.d.l in kN/m that should be placed on the entire 6m span of a simply supported beam so that the beam can carry a maximum bending moment of 18 kN-m.
4. Define "Section Modulus" and what is its value for a circular section of diameter 'd'?.
5. Draw the shapes of bending stress distribution and shear stress distribution along the depth of a T-beam.
6. Determine the axial force in the member AB of the truss shown below.



PART-B

4 x 12 = 48M

1. a) A mild steel rod of 20mm diameter and 300 mm long is enclosed centrally inside a hollow copper tube of external diameter 30mm and internal diameter 25mm. The ends of the rod and tube are rigidly attached together, and the composite bar is subjected to an axial pull of 40kN. Find the stresses developed in the rod and the tube. Take E_S=200 GPa and E_C=100 GPa. (6M)

b) A steel bar 2m long, 40mm wide and 20mm thick is subjected to an axial pull of 160kN in the direction of length. Find the changes in length, width and thickness of the bar.
Take E=200 GPa and poission's ratio=0.3 (6M)

2. a) Derive the expression for relation between young's modulus and shear modulus. (6M)

b) A weight of 2kN falls through a height of 10mm on to a collar rigidly attached to the lower end of a vertical bar, 3m long and 600 mm^2 area of cross section. Find the maximum instantaneous stress and max. strain energy stored in the member. Take E=200 GPa (6M)

3. a) Construct S.F and B.M diagrams for the following loaded overhang beam. Also locate the point of contraflexure. (8M)

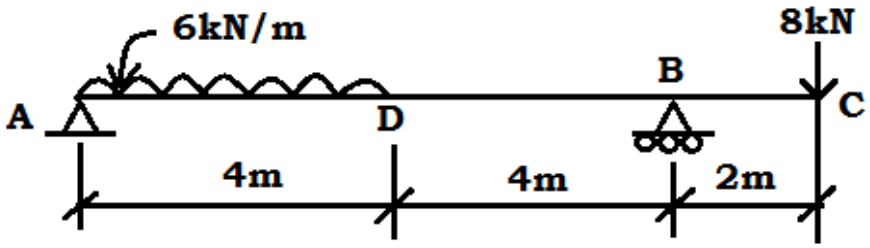


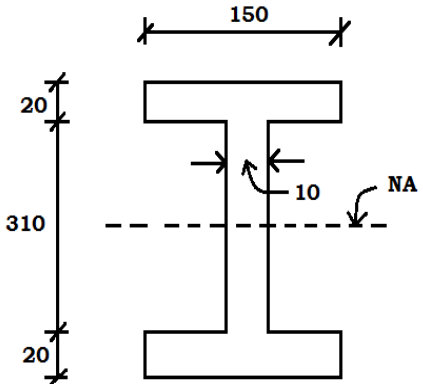
Fig.3(a)

b) Show that shear force at a section in a beam is equal to the rate of change of bending moment at that section. (4M)

4. a) A timber beam of rectangular section of length 8m is simply supported at its ends. The beam carries an u.d.l of 12 kN/m over the entire length and a point load 12 kN at mid span. If the depth is twice to the width of beam and the bending stress is not to exceed 8 N/mm^2, find suitable dimensions of the section. (8M)

b) What are the stability conditions for a masonry retaining wall? (4M)

5. a) An I-Section beam shown in Fig 5(a) is subjected to a shear force of 40 kN at the section. Find the maximum shear stress developed in the I Section. (6M)



(All Units are in mm)

Fig.5(a)

b) A shaft has to be designed to transmit a power of 100 kW at 300 rpm. Determine the diameter required for a solid circular shaft of steel for which the permissible shear stress is 90 N/mm^2 (6M)

6. Determine the axial forces in all members of the truss shown in fig.6. (12M)

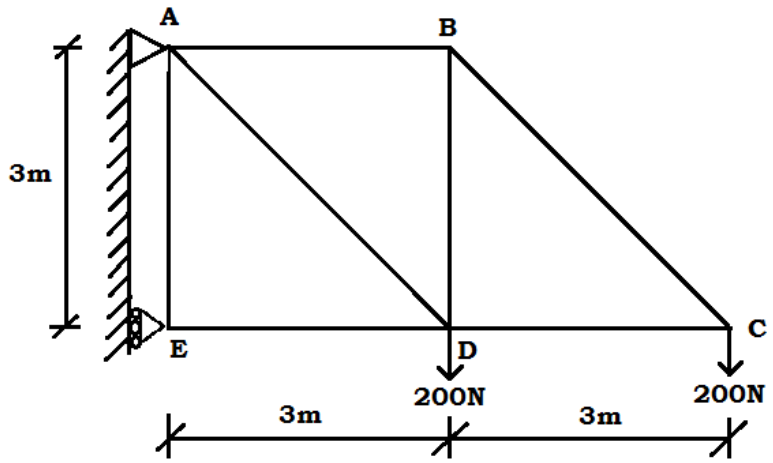


Fig.6

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