Code: 9A01301

R09

B.Tech II Year I Semester (R09) Supplementary Examinations, May 2013

MECHANICS OF SOLIDS

(Common to AE, ME and MCT)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

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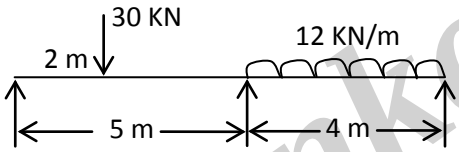
1 (a) Derive the relationship between the elastic moduli.

(b) A reinforced short concrete column 250 mm × 250 mm in section is reinforced with 8 steel bars. The total area of steel bars in $2500\ \mathrm{mm}^2$. The column carries a load of $390\ \mathrm{kN}$. If the modulus of elasticity for steel is 15 times that of concrete; find the stresses in concrete and steel.

2 Draw the bending moment and shear force diagrams for S.S. beam shown in figure indicating the principal values.



3 State the assumptions in theory of simple bending. Derive the expression for bending stress.

4 Derive an expression for the shear stress at any point in a circular section of a beam, which is subjected to a shear force F.

5 Derive an expression for the shear stress produced in a circular shaft which is subject to torsion. What are the assumptions made in the derivation?

6 Determine:

(i) Slope at the left support.

(ii) Deflection under the load.

(iii) Maximum deflection of 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.

Take $\mathrm{E} = 2 \times 10^5\ \mathrm{N/mm^2}$ and $\mathrm{I} = 1 \times 10^8\ \mathrm{mm^4}$.

7 A cylindrical shell 3 m long which is closed as the ends has an internal diameter of 1 m and a wall thickness of 15 mm. Calculate the circumferential and longitudinal stresses induced and also changes in the dimensions of the shell, if it is subjected an internal pressure of $1.5\ \mathrm{N/mm^2}$. Take $\mathrm{E} = 2 \times 10^5\ \mathrm{N/mm^2}$ and $\frac{1}{\mathrm{m}} = 0.3$.

8 Write short notes on:

(a) Thick cylinders subjected to inside pressures.

(b) Mohr's theorems.

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