



9. Write the expression to calculate the power transmitted in a circular shaft; subjected to torsion.
10. The mean coil diameter of a helical spring and diameter of the coil are 8 cm and 8 mm respectively. Find the spring index if it carries an axial load of 10 N.

PART B — (5 × 16 = 80 marks)

11. (a) A bar of 20 mm diameter is subjected to a pull of 50 kN. The measured extension over a gauge length of 200 mm is 0.10 mm and the change in diameter is 0.0036 mm. Calculate the Poisson's ratio and the value of modulus of elasticity and bulk modulus.

Or

- (b) (i) Explain with a neat sketch the stress strain curve for a mild steel bar subjected to tension. (8)
- (ii) At a point in a strained material the normal stresses on two planes at right angles are  $8 \text{ kN/cm}^2$  and  $6 \text{ kN/cm}^2$  both tensile. Find the intensity of stress on a plane inclined at  $60^\circ$  to the axis of maximum stress. (8)
12. (a) For the truss shown in Fig. 12(a) find the forces in members AB, AE and BC by method of sections.

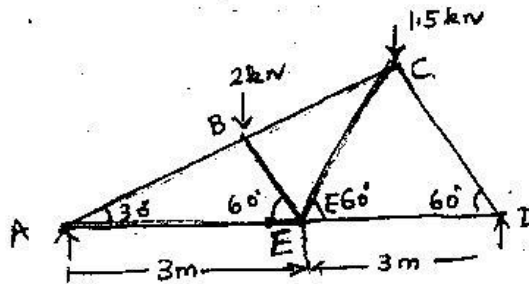


Fig. 12(a)

Or

- (b) A copper tube of 5 cm diameter, 1 metre long and 1.25 mm thick has closed ends and is filled with water under pressure. Neglecting any distortion of the end plates, determine the alteration of pressure when an additional volume of 3 C.C of water is pumped into the tube  $G = 1.03 \times 10^7 \text{ N/cm}^2$ ,  $\mu = 0.3$ ,  $K \text{ for water} = 2.1 \times 10^9 \text{ N/cm}^2$ .

13. (a) For the beam shown in Fig. 13(a) draw SFD and BMD indicating salient points.

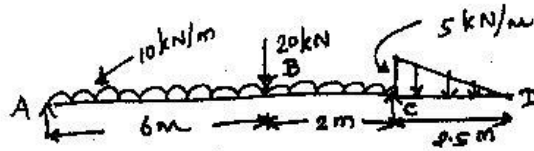


Fig. 13(a)

Or

- (b) A T-section of a beam has the following dimensions

Flange width : 100 mm, Overall depth : 80 mm

Thickness of web : 10 mm, thickness of flange : 10 mm

Determine the maximum bending stress in the beam, when a B.M. of 200 N.M. is applied. Also sketch the bending stress variation.

14. (a) For the beam shown in Fig. 14(a), find the slope at A and deflection at C by conjugate beam method  $E = 200$  GPa.

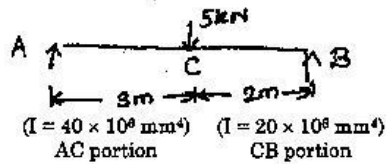


Fig. 14(a)

Or

- (b) An I section beam is shown in Fig. 14(b). It carries a shear force of 500 kN at a section. If the moment of inertia of the section is  $1164 \times 10^6 \text{ mm}^4$ , calculate the maximum and also web junction shear stress.

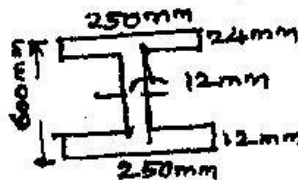


Fig. 14(b)

15. (a) A circular solid shaft transmits 115 kW power at 300 rpm. If the permissible shear stress is  $75 \text{ N/mm}^2$  and allowable twist is  $1.5^\circ$  in a length of 3 meters, determine the diameter of the shaft  
 $G = 82 \times 10^9 \text{ N/m}^2$ .

Or

- (b) (i) A laminated spring has the following : spring 750 mm long, 8 leaves, equal thickness of 50 mm wide. Find the thickness of the leaves if the stress in the material is to be limited to 250 MPa; when the spring is loaded to 9 kN at the centre. To what radius should the leaves be initially bent for the spring to be flat when under this load and what is the central deflection  $E = 2 \times 10^5 \text{ N/mm}^2$ . (8)

- (ii) An open coil helical spring made of 5 mm diameter, wire has 16 coils, 100 mm inner diameter with helix angle of  $16^\circ$ . Calculate the deflection, maximum direct and shear stress induced due to an axial load of 300 N

$$E = 200 \text{ GPa}, G = 90 \text{ GPa.} \quad (8)$$