

STRENGTH OF MATERIALS

1. (a) Draw stress-strain curve for mild steel in tension test and explain salient features of the curve. (7)
- (b) Determine the deformation of the steel rod as shown in Fig. Q. 1(b) under the given loads. Also find the stresses in different portions of the rod. Take $E = 200 \text{ GPa}$. (7)

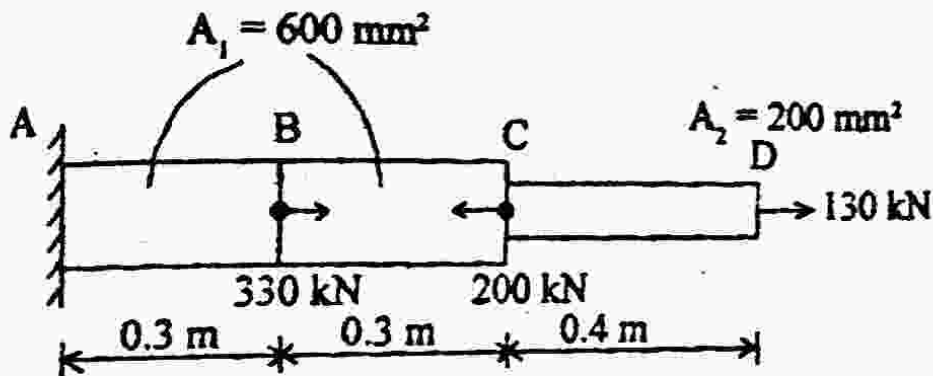


Fig. Q. 1(b)

2. (a) Derive the relation between the modulus constants E , K and G , using usual notations. (7)
- (b) A thin cylindrical shell 1 m in diameter and 3 m long has a metal wall thickness 10 mm. It is subjected to an internal fluid pressure of 3 MPa. Find the circumferential and longitudinal stresses in the wall. Determine the changes in length, diameter and volume of the cylinder. Take $E = 210 \text{ GPa}$ and $\nu = 0.3$. (7)
3. (a) What is the point of contraflexure? (2)
- (b) Draw SFD and BMD for the beam AB as shown in Fig. Q. 3(b). (11)

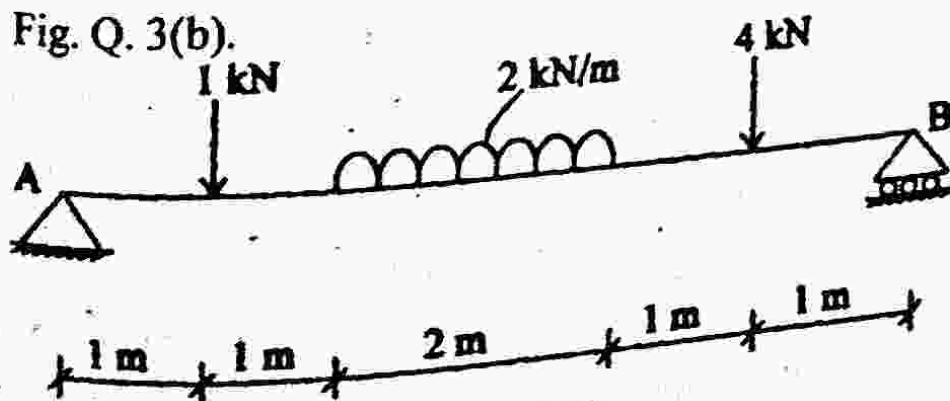


Fig. Q. 3(b)

4. Draw SFD and BMD for the beam ABCD as shown in Fig. Q. 4. Locate the points of contraflexure, if any. (13)

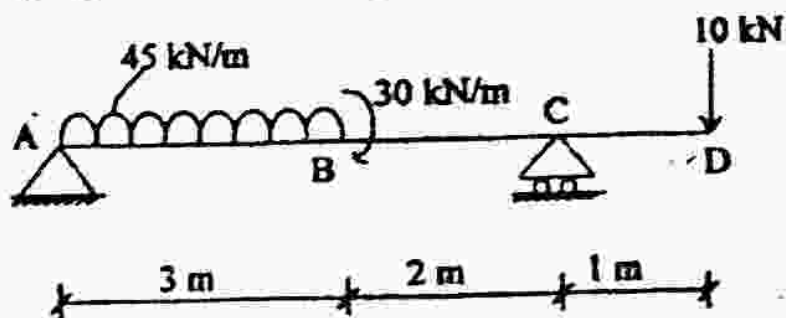
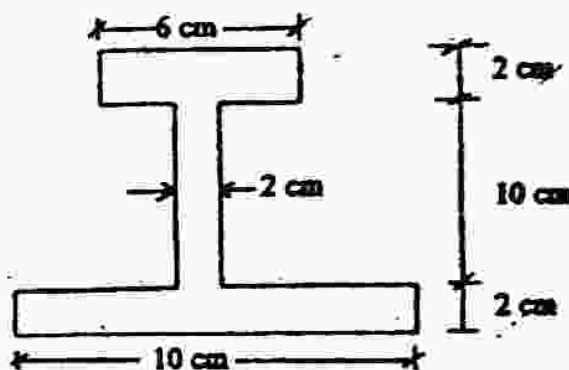


Fig. Q. 4

5. (a) Explain neutral axis and section modulus of a beam. (3)
 (b) Find the maximum stress induced in a beam as shown in Fig. Q. 5(b) if it is subjected to a maximum sagging BM of 10 kNm. Also draw stress distribution diagram. (10)



OR

6. (a) Draw a typical shear stress distribution over an I-beam subjected to a shear force. (2)
 (b) A simply supported beam carries an udl of 30 N/mm over span of 1 m. The c/s of the beam is a T-section having top flange of (125 mm x 25 mm thick) and web of (175 mm x 25 mm thick). Draw shear stress distribution diagram. (11)
7. A hollow circular shaft 20 mm thick transmits 294 kW at 200 r.p.m. Determine the diameters of the shaft if shear strain due to torsion is not to exceed 8.6×10^{-4} . Take $G = 80 \text{ Gpa}$. (13)

OR

8. Derive the torsional formula stating suitable assumptions, for a solid circular rod subjected to torsion. (13)

A beam AB of 4 m span is simply supported at the ends and is loaded as shown in Fig. Q. 9. Determine deflection at C, maximum deflection and its location and the slope at end A. Take $E = 200 \times 10^6 \text{ kN/m}^2$ and $I = 20 \times 10^6 \text{ m}^4$ (13)

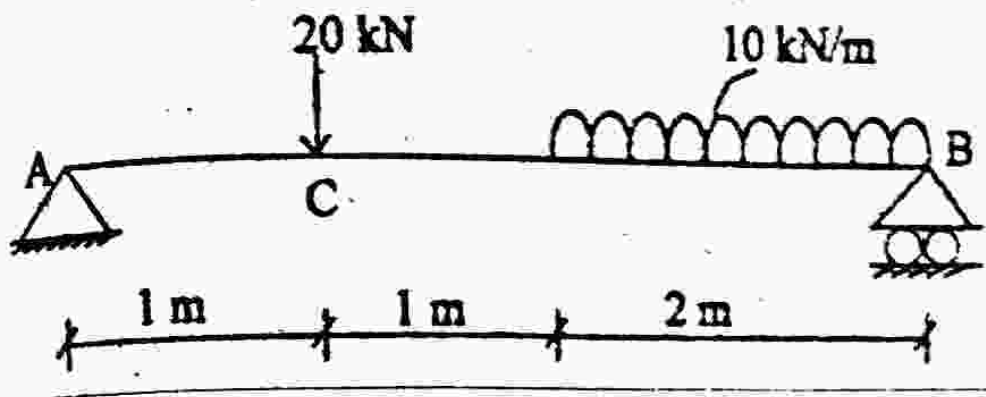


Fig. Q. 9

OR

10. An overhanging beam ABC is loaded as shown in Fig. Q. 10. Determine the deflection at point C and the maximum deflection between A and B. Take $E = 200 \times 10^6 \text{ kN/m}^2$ and $I = 24 \times 10^6 \text{ m}^4$. (13)

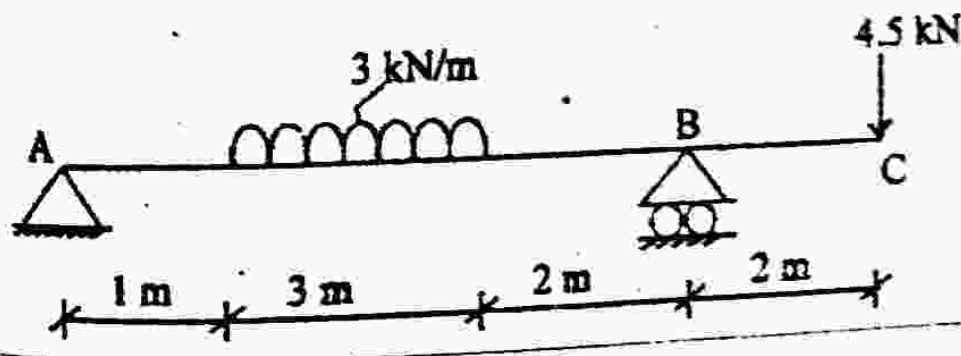


Fig. Q. 10

11. For the stressed element as shown in Fig. Q. 11, find the following :
- Normal and tangential stresses on the inclined plane AB with $\theta = 30^\circ$ as shown;
 - Principal stresses and principal planes with their inclinations; and

(iii) Maximum shear stress and the direction of its plane. (14)

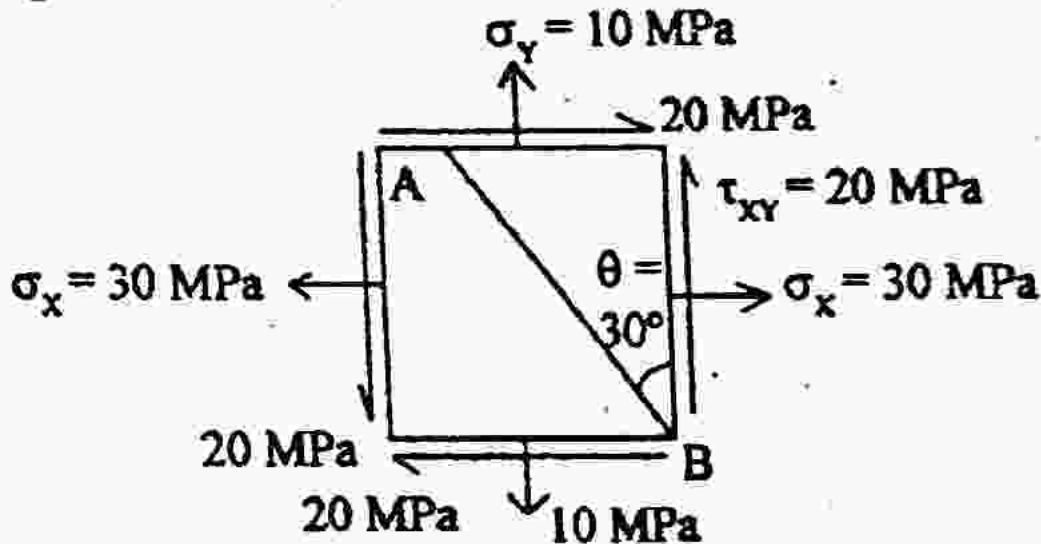


Fig. Q. 11

OR

12. Explain the following :
- (i) Principal stresses and principal planes and their significance. (4)
 - (ii) Construction of Mohr's circle and its application. (5)
 - (iii) Shear centre and shear flow. (5)