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**Question Paper Code : 23226**

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2013.

Fourth Semester

Civil Engineering

CE 1252/CE 1255/070100035 – STRENGTH OF MATERIALS

(Regulation 2004/2007)

(Common to B.E. (Part-Time) Third Semester, Regulation 2005)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. A tensile load on 60 KN is gradually applied to a circular bar of 4cm diameter and 5m long. Take  $E=2 \times 10^5$  Mpa, determine strain energy absorbed by the rod.
2. State Costigliano's theorem-I.
3. Write any two relations between actual beam and conjugate beam.
4. A propped Cantilever beam and span L is subjected to a point load at mid-span. Draw a qualitative sketch of bending moment diagram and deflected shape.
5. Write the limitation of Euler's formula.
6. State any two applications of a compound cylinder.
7. What do you mean by direct stress and bending stress?
8. State any two practical applications of the theories of failure.
9. Write a short note on the behaviour due to unsymmetrical bending for unsymmetrical sections.
10. State the basic mechanisms to illustrate the behaviour in fatigue and fracture.

PART B — (5 × 16 = 80 marks)

11. (a) A bar of uniform cross Section 'A' and Length 'L' hangs vertically. Subjected to its own weight. Prove that the strain energy stored within the bar is give by  $U = \frac{A \times \delta^2 \times L^2}{6E}$   $\delta =$  Unit weight

Or

- (b) Determine the horizontal and vertical deflection of joint 'A' for the truss shown in Fig 11. (b). Assume  $AE=50,000$  KN for all members. Use any one energy principle.

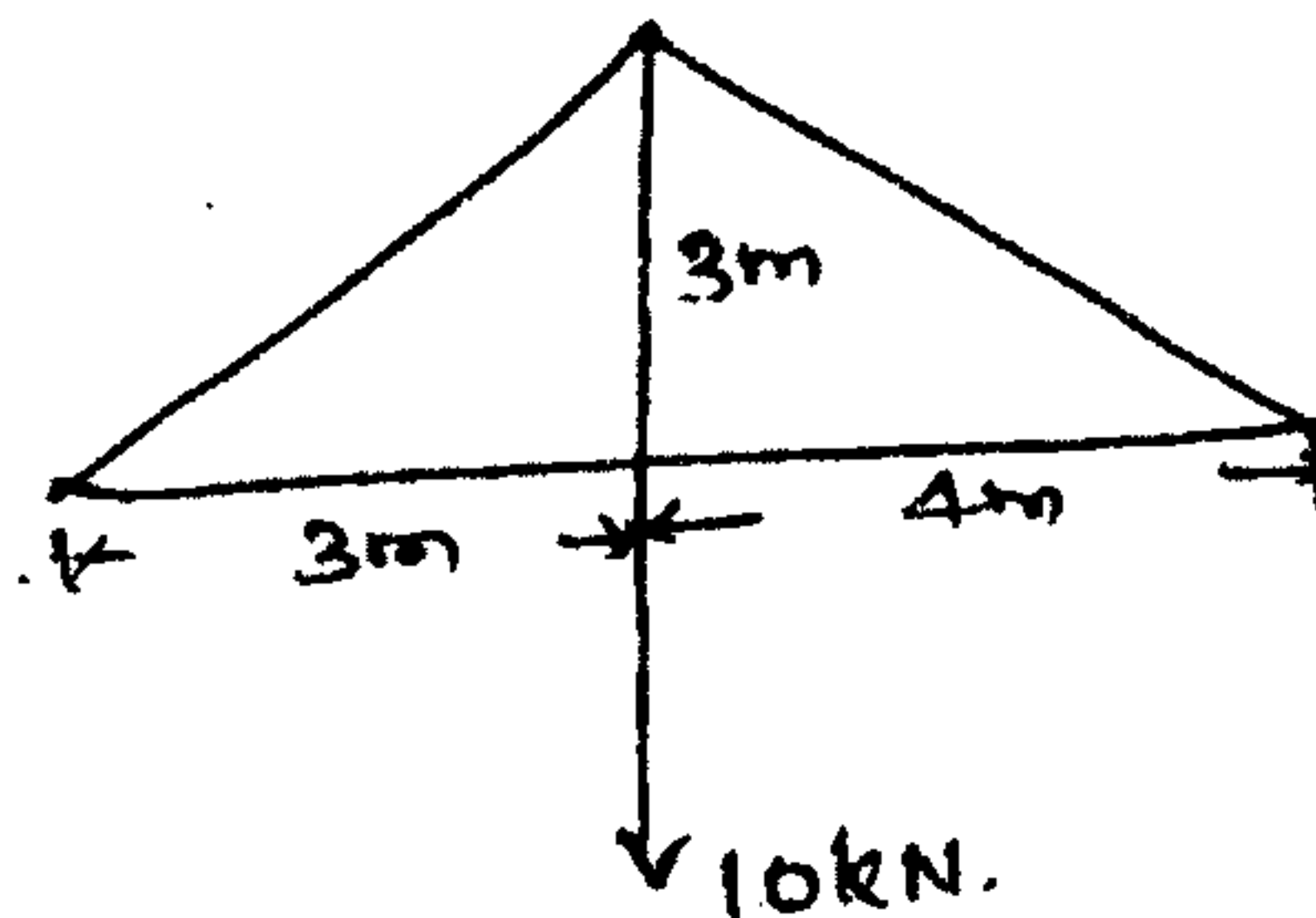


Fig. 11(b)

12. (a) A fixed beam of span 12m is subjected to two concentrated loads as shown in Fig 12(a). Find the fixed and moments and also draw the bending moment diagram and mark the salient points.

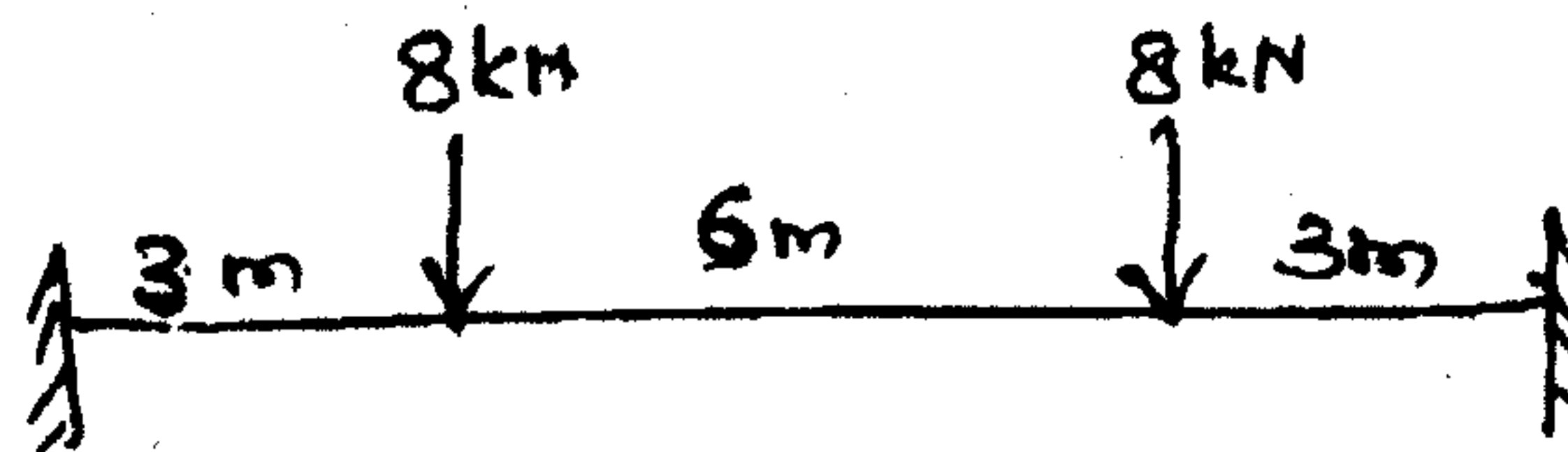


Fig. 12 (a)

Or

- (b) A continuous beam ABCD, simply supported at A,B,C, and D is loaded as shown in Fig.12(b). Find the moments over the beam and also draw B.M and S.F. diagrams.

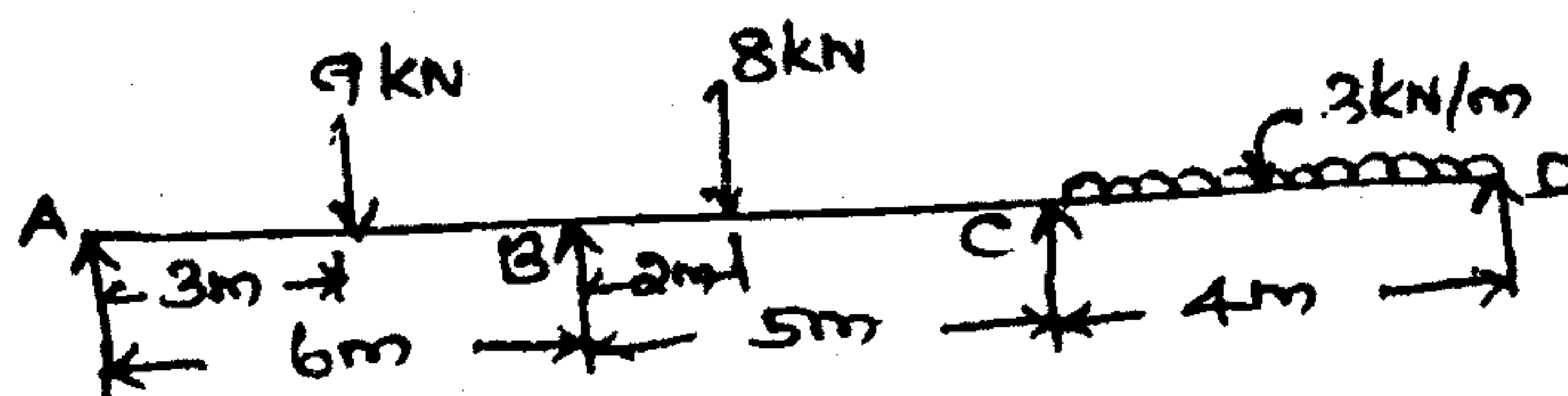


Fig. 12 (b)

13. (a) Find the Euler crushing load for a hollow cylindrical C.I. column 20 cm external diameter and 25mm thick if it is 6m long and is fixed at both ends. Take  $E=1.2 \times 10^5$  Mpa. Compare the load with the crushing load as given by Rankine's formula, Taking  $\sigma_c=550$  Mpa and  $a=\frac{1}{1,600}$ . Give the proper comment.

Or

- (b) The cylinder of a hydraulic press has an internal diameter of 300mm and is to be designed to withstand a pressure of 12.5 Mpa without the material being stressed over 25 Mpa. Determine the thickness of the material and stress on the outside of cylinder. Sketch a diagram showing the variation of radial and hoop stresses across the thickness of the wall of the cylinder.
14. (a) (i) State Tresca and Von Mises criteria. (4)
- (ii) A Steel bolt is subjected to bending moment of 250 Nm and a Torque of 120 Nm. If the yield stress in tension for the bolt material is 250 Mpa. Determine the diameter of the bolt of using Tresca yield criterion and Von Mises Yield criterion. (12)

Or

- (b) The Intensity of Resultant stress on a plane AB Fig. 14(b) at a point in a material under stress is  $800 \text{ N/cm}^2$  and it is inclined at  $30^\circ$  to the normal to that plane. The normal component of stress on another plane BC at right angles to plane AB is  $600 \text{ N/cm}^2$ .

Determine the following :

- (i) the resultant stress on the plane BC (6)
- (ii) the principal stresses and their directions (5)
- (iii) the maximum shear stresses. (5)

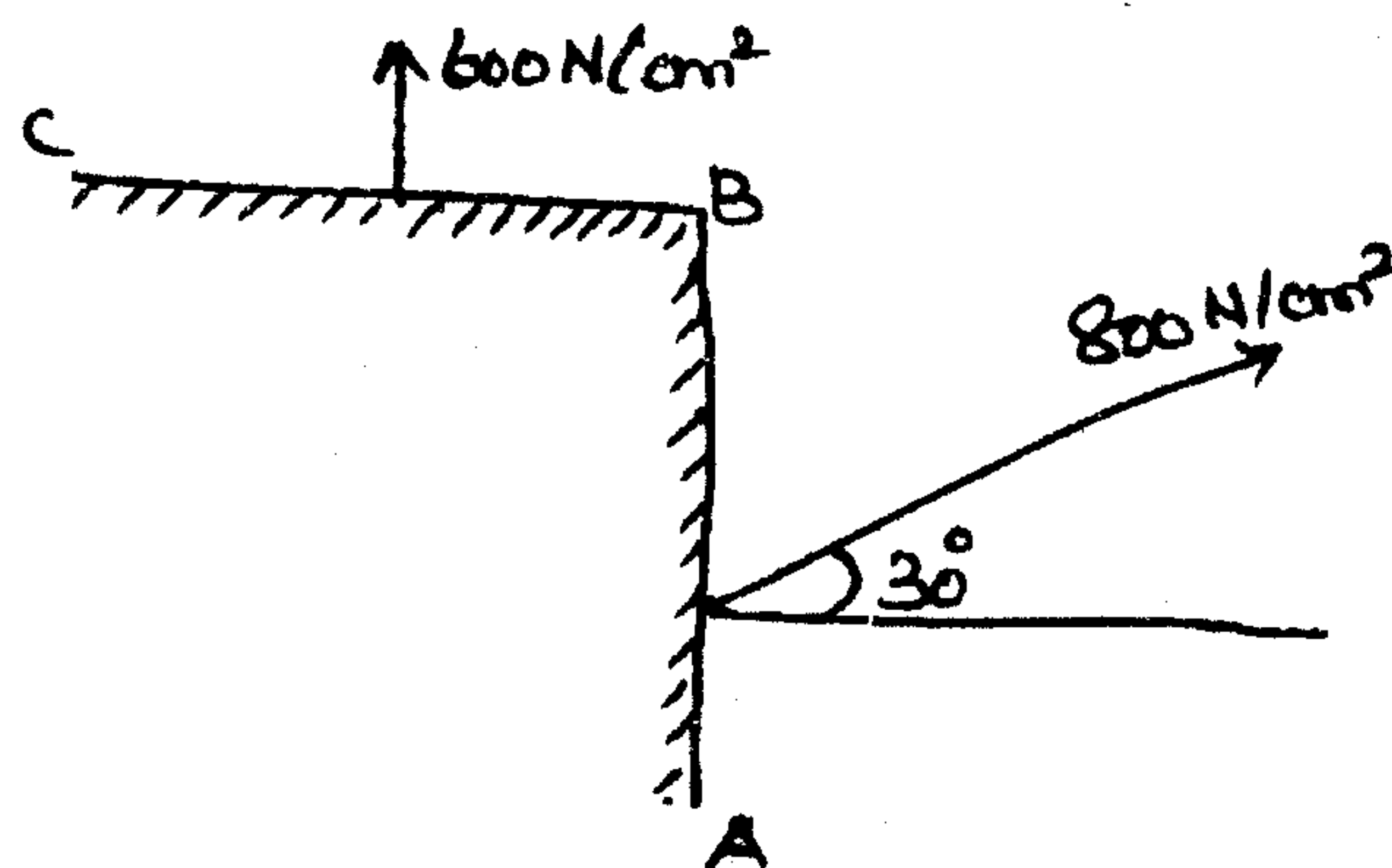


Fig 14.(b)

15. (a) A  $25\text{cm} \times 25\text{cm}$  angle is loaded as shown in Fig.15(a). The total load  $P$  is  $70\text{ KN}$ . Find the direction of neutral axis between the loads. Also calculate the values of bending stresses at A,B and C.

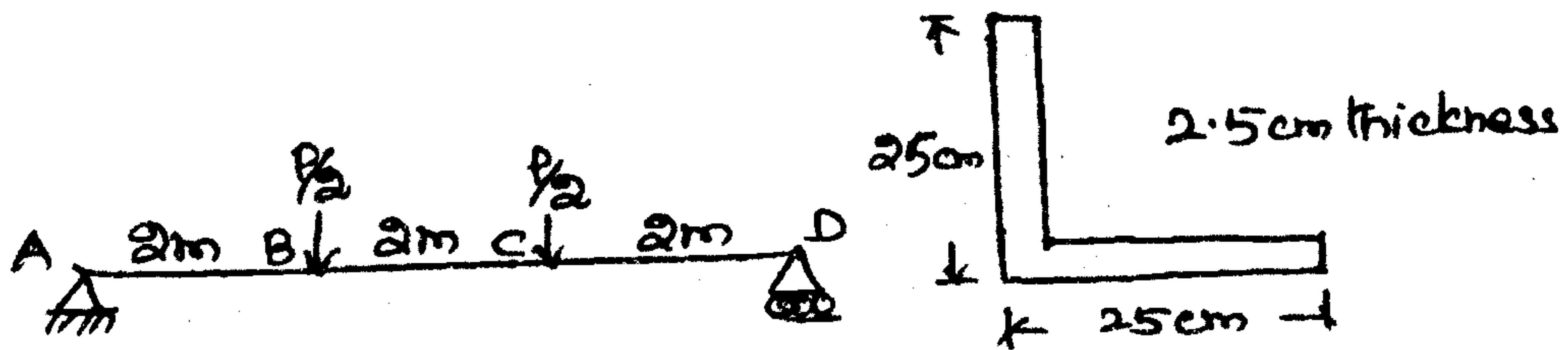


Fig. 15 (a)

Or

- (b) A curved bar of rectangular section, initially unstressed, is subjected to bending moment of  $1600\text{ N.M}$ , which tends to straighten the bar. The Section is  $50\text{mm}$  wide by  $60\text{mm}$  deep in the plane of bending and the mean radius of curvature is  $100\text{ mm}$ . Find the position of neutral axis and magnitudes of greatest bending stress. Draw the variation of bending stress across the section.