

R 8140

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2006.

Fifth Semester

Civil Engineering

CE 331 — STRUCTURAL ANALYSIS — I

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Write the methods of finding deflections of pin-jointed plane frame.
2. Differentiate between virtual force and virtual displacement.
3. What is meant by “compatibility condition”?
4. Derive the relation between flexibility and stiffness.
5. Explain the principles involved in the slope deflection method.
6. Show frames with and without side sway with neat sketches.
7. Define the term ‘stiffness’.
8. What are the advantages of moment distribution method?
9. Write the element stiffness matrix for a truss member.
10. Differentiate between local coordinates and global coordinates.

PART B — (5 × 16 = 80 marks)

11. (a) Using the principle of virtual work, determine the vertical and horizontal deflection components of joint C of the truss in Fig. 1 cross-sectional area of each bar $150 \times 10^{-6} \text{ m}^2$ and $E = 200 \times 10^6 \text{ kN/m}^2$.

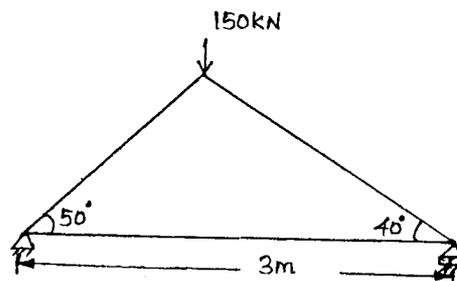


Fig. 1
Or

- (b) Using the method of virtual work, determine the horizontal displacement of a point C of the frame shown in Fig. 2. Take $E = 2 \times 10^5 \text{ N/mm}^2$
 $I = 4 \times 10^6 \text{ mm}^4$.

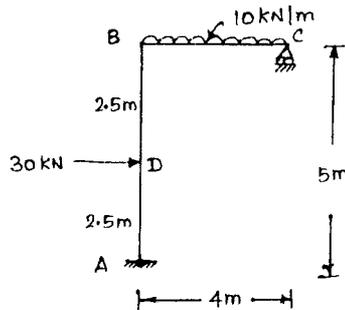


Fig. 2

12. (a) Analyse the continuous beam in Fig. 3 by flexibility method.

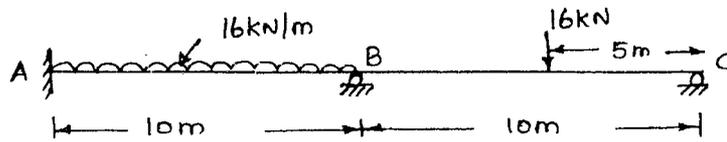


Fig. 3

Or

- (b) Using matrix flexibility method analyse the truss loaded as shown in Fig. 4 and find the member forces. A and E are the same for all members.

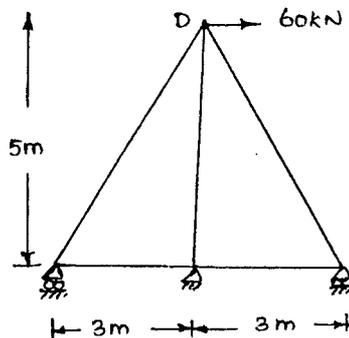


Fig. 4

13. (a) Analyse the continuous beam loaded as shown in Fig. 5 by the slope deflection method and sketch the bending moment diagram, given : $2 I_{AB} = I_{BC} = 2 I_{CD} = 2 I$

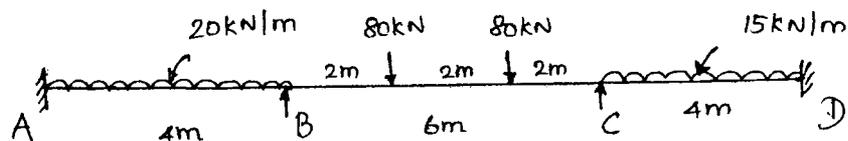


Fig. 5

Or

- (b) Analyse the structure shown in Fig. 6 by the slope deflection method. Sketch the bending moment and shear force diagrams.

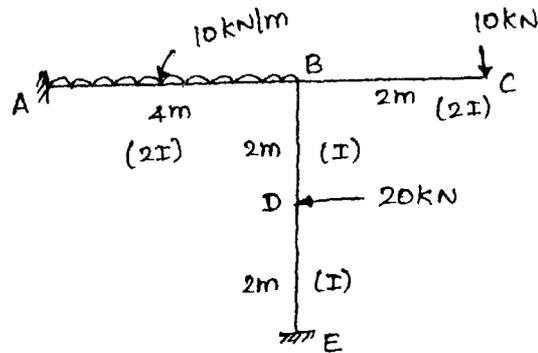


Fig. 6

4. (a) Analyse the continuous beam loaded as shown in Fig. 7 by the method of moment distribution. Sketch the bending moment and shear force diagrams.

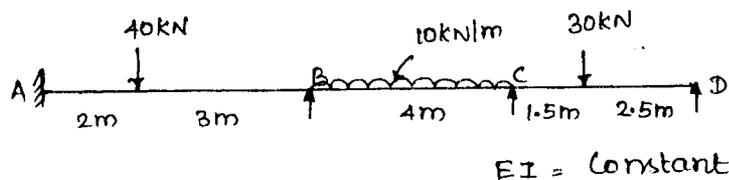


Fig. 7

Or

- (b) Analyse the structure loaded as in Fig. 8 by the moment distribution method and sketch the bending moment and shear force diagrams.

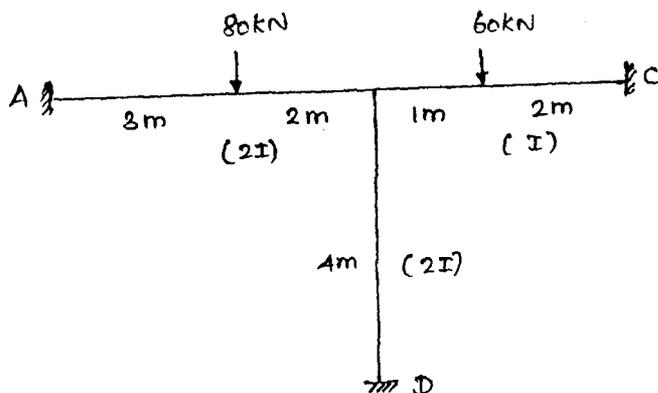


Fig. 8

15. (a) A two span continuous beam ABC is fixed at A and simply supported over the supports B and C. $AB = 6\text{ m}$ and $BC = 6\text{ m}$. The moment of inertia is constant throughout. It is loaded as shown in Fig. 9. Analyse the beam by matrix stiffness method.

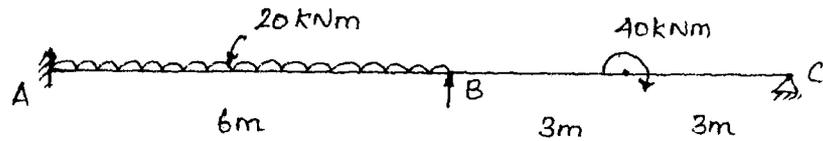


Fig. 9

Or

- (b) Analyse the frame shown in Fig. 10 by the matrix stiffness method.

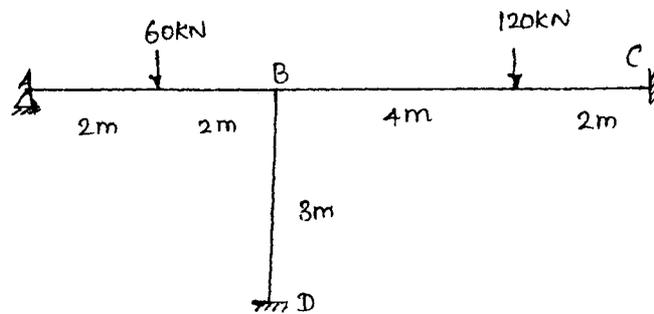


Fig. 10