

Note: Please attempt all questions. Assume missing data suitably, if any.

1. Please attempt any two parts.
 - (a) Please derive the member stiffness matrix of a plane frame member (8)
 - (b) Please derive the rotation transformation matrix of a plane truss member. (8)
 - (c) Please derive the relationship between global stiffness matrix and local stiffness matrix. (8)
2. (a) A two span continuous beam is shown in Fig. 1. Please develop overall stiffness matrix and combined load vector using the computer oriented approach. Please also compute unknown joint displacements and support reactions. (12)

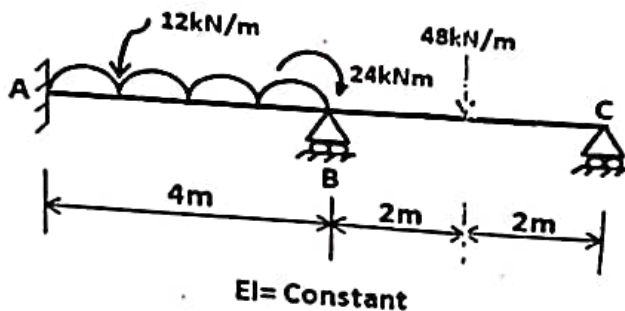


Fig. 1

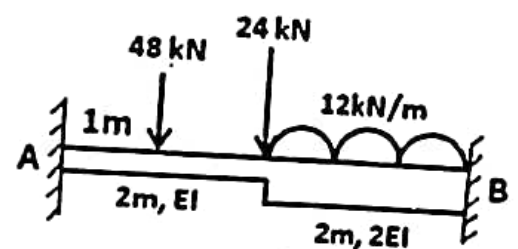


Fig. 2

- (b) Please analyse the fixed beam shown in Fig. 2 using stiffness method. (10)
3. (a) Please analyse the plane frame shown in Fig. 3 using stiffness method. Please neglect the axial deformation in the members. (10)

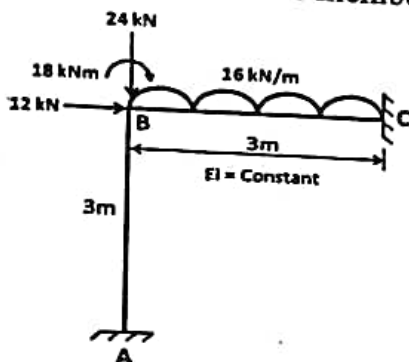


Fig. 3

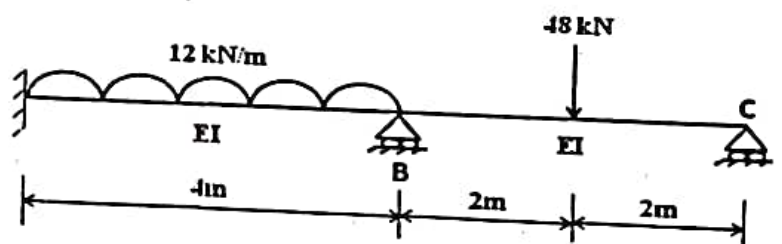


Fig. 4

- (b) Please analyse the two span continuous beams shown in Fig. 4 using flexibility method of analysis. Draw SFD & BMD. Also sketch the deflected shape. (10)
4. (a) Please determine the load factor for the portal frame shown in Fig. 5. Also sketch the bending moment diagram at collapse. Take $M_p = 48 \text{ kNm}$ for all the members. (10)

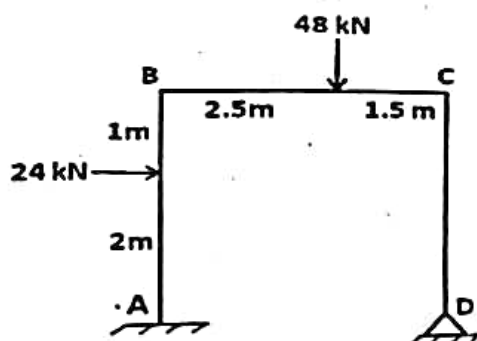


Fig. 5

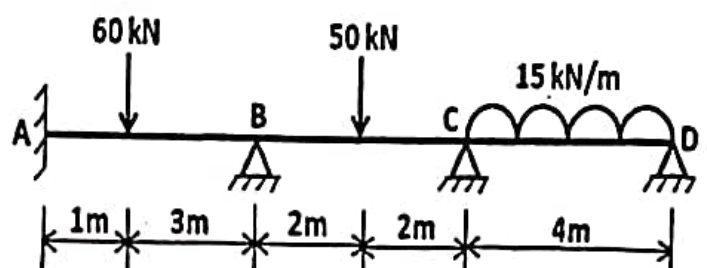


Fig. 6

- (b) A continuous beam having uniform I Section throughout with service loads is shown in Fig. 6. Please find the section modulus required for I beam. Assume load factor as 1.7 and yield stress of the material (Fe 410) σ_y as 250 MPa.
5. (a) Please analyse the portal frame shown in Fig. 7 using moment distribution method. Draw SFD and BMD. Also sketch the deflected shape. (12)

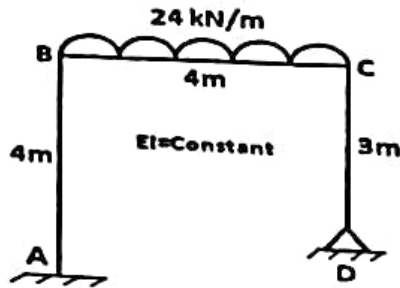


Fig. 7

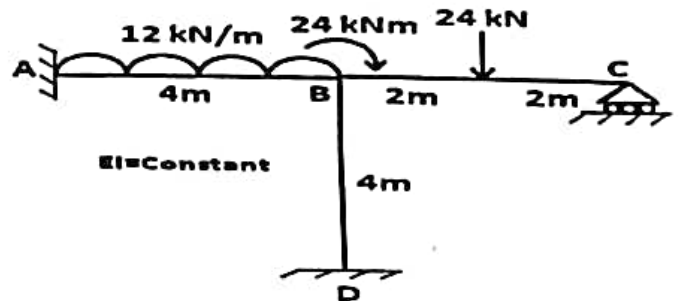


Fig. 8

- (b) Please analyse the frame shown in Fig. 8 using slope deflection method. Draw SFD and BMD. Also sketch the deflected shape. (12)
6. Please attempt any three parts.
- (a) Please find the force in the bar BD shown in Fig. 9. (6)
- (b) Please draw the bending moment diagram of the continuous beam shown in Fig. 10. (6)
- (c) Please find the slope of the member AB at B (Fig. 11). (6)
- (d) Please find the force in the member AC of the truss shown in Fig. 12. Length of AD is L and axial rigidity is AE for all the members. (6)

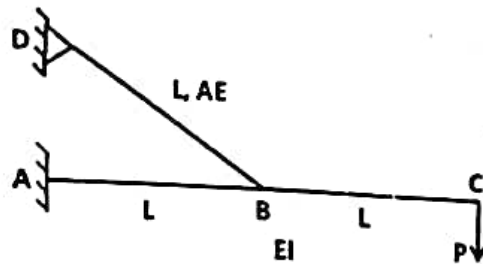


Fig. 9

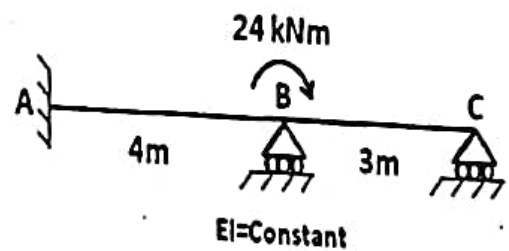


Fig. 10

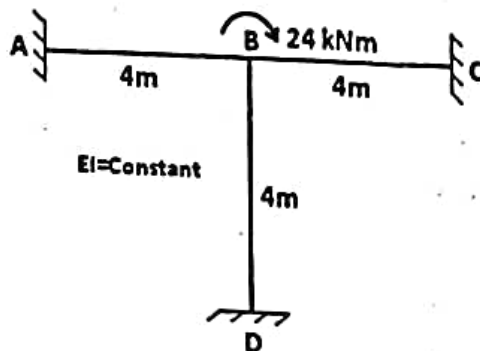


Fig. 11

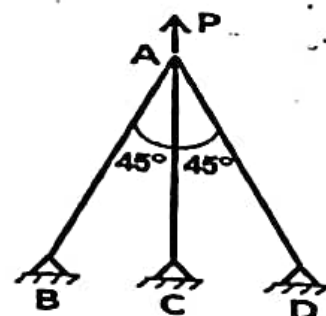


Fig. 12