

12. a) A frame ABCD consists of two equilateral triangles and is hinged at A and supported on rollers at D as shown in Figure 12a. Determine the vertical deflection of C and horizontal movement of D due to a load W applied vertically at C. All the members are of length L. All the tension members are of area a and compression members of area $2a$.

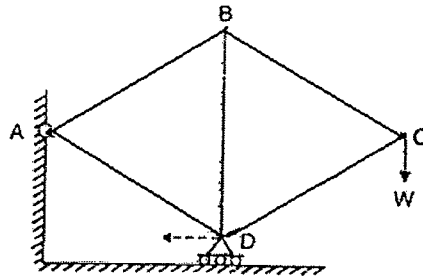


Fig. Q12.a

(OR)

- b) Determine the horizontal displacement at support D for the frame shown in Figure Q12.b. Relative I values are indicated along the members. Given $E = 200 \times 10^6$ kN/m² and $I = 300 \times 10^{-6}$ m⁴

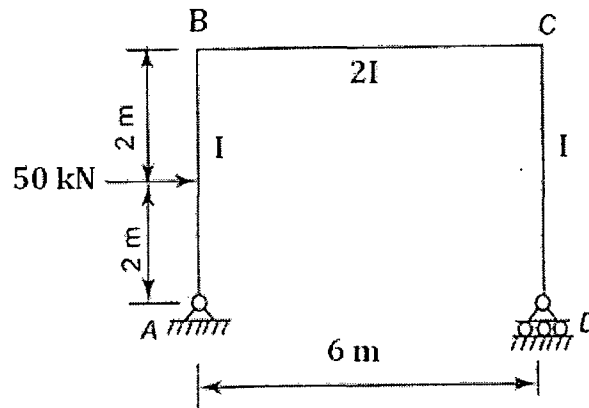


Fig. Q12.b

13. a) Using the flexibility method, analyse the pin-jointed frame in Figure Q13.a. The cross-sectional areas A and E are same for all the members.

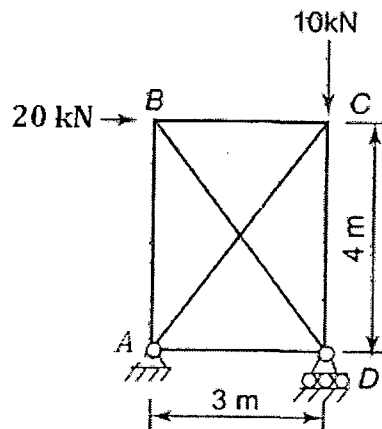


Fig. Q13.a
(OR)

- b) Analyse the rigid frame shown in Figure Q.13.b by Flexibility Method (Or Slope deflection Method) and determine the member end moments and support reactions. $EI_{AB}=48000 \text{ kNm}^2$; $EI_{BC}=60000 \text{ kNm}^2$; $EI_{CD}=32000 \text{ kNm}^2$

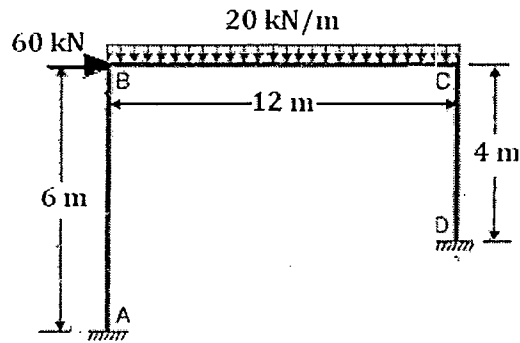


Fig. Q13.b

14. a) Draw the bending moment diagram and sketch the deflected shape of the frame shown in Figure Q 14.a. The ends A and D are fixed and BC is loaded with U.D.L of 6 kN/m. Use Moment Distribution Method.

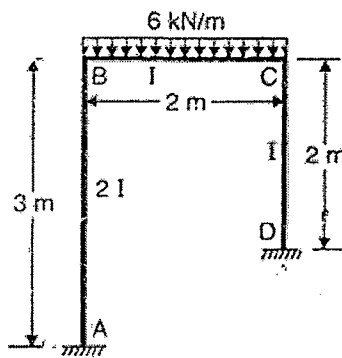


Fig. Q14.a

(OR)

- b) Analyze the box culvert shown in Figure 14.b. All the joints A, B, C and D are rigid. Plot the bending moment diagram and the deflected shape of the frame. Use Moment Distribution Method.

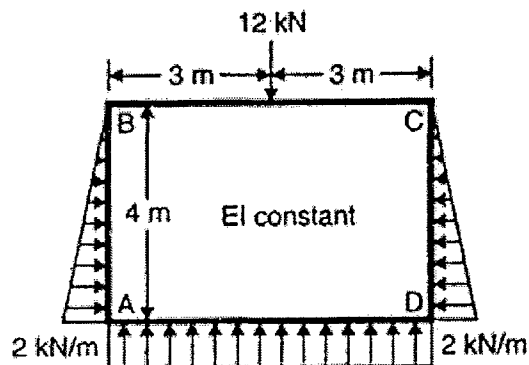
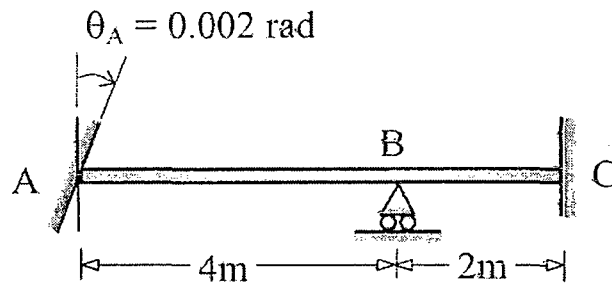


Fig. Q14.b

15. a) Consider the two-span prismatic continuous beam shown in Figure 15.a. Analyse the beam by the direct stiffness method, given that a clockwise rotational slip $\theta_A = 0.002$ radian occurs at the fixed end A. Sketch the deflected shape and draw the bending moment diagram. Assume $EI = .8 \times 10^4 \text{ kN m}^2$



EI constant

Fig. Q15.a

(OR)

- b) Using the Direct stiffness method, determine the displacements at joint A and forces under loads P_1 and P_2 for the pin-jointed frame shown in Figure 15.b. AE is the same for all members.

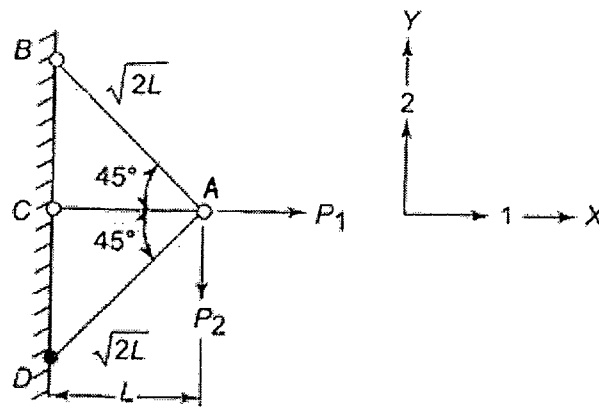


Fig. Q15.b