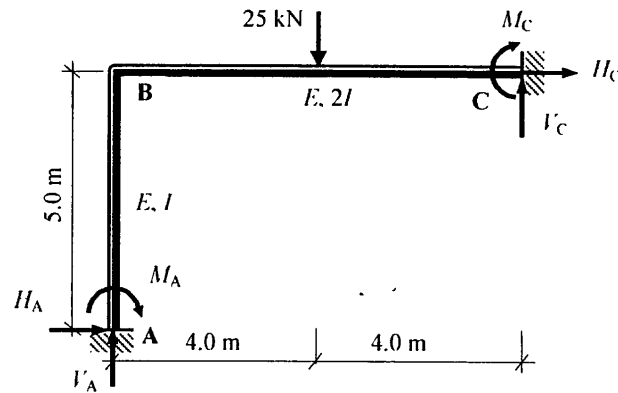
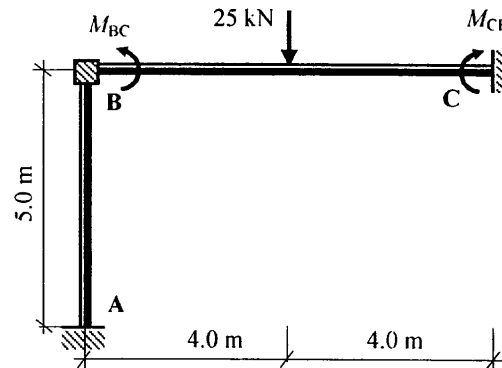


5.2.3 Solutions: Moment Distribution – No-Sway Rigid-Jointed Frames

Solution**Topic: Moment Distribution – No-Sway Rigid-Jointed Frames****Problem Number: 5.5****Page No. 1****Fixed-end Moments:**

Member BC

$$M_{BC} = -\frac{PL}{8} = -\frac{25 \times 8}{8} = -25.0 \text{ kNm}$$

$$M_{CB} = +\frac{PL}{8} = +\frac{25 \times 8}{8} = +25.0 \text{ kNm}$$

Distribution Factors : Joint B

$$k_{BA} = \left(\frac{I}{5}\right) = 0.2I$$

$$k_{\text{total}} = 0.45I$$

$$DF_{BA} = \frac{k_{BA}}{k_{\text{Total}}} = \frac{0.2}{0.45} = 0.44$$

$$k_{BC} = \left(\frac{2I}{8}\right) = 0.25I$$

$$DF_{BC} = \frac{k_{BC}}{k_{\text{Total}}} = \frac{0.25}{0.45} = 0.56$$

In this case, since there is only one internal joint, only one balancing operation and one carry-over will be required during the distribution of the moments.

Solution

Topic: Moment Distribution – No-Sway Rigid-Jointed Frames

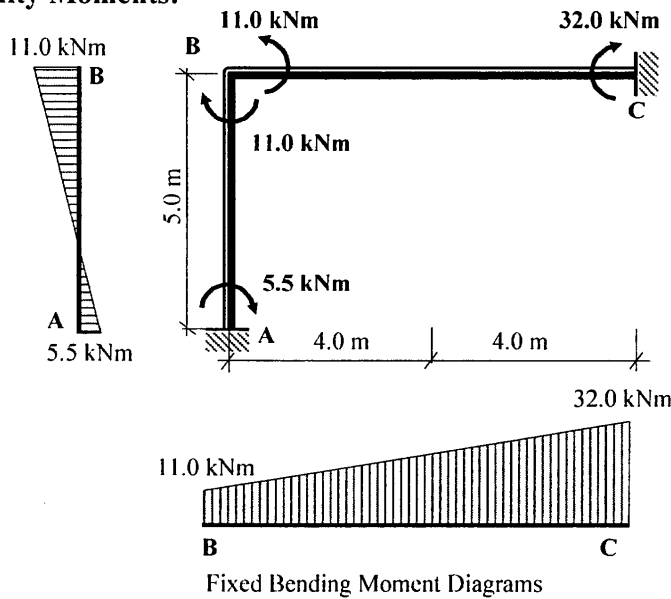
Problem Number: 5.5

Page No. 2

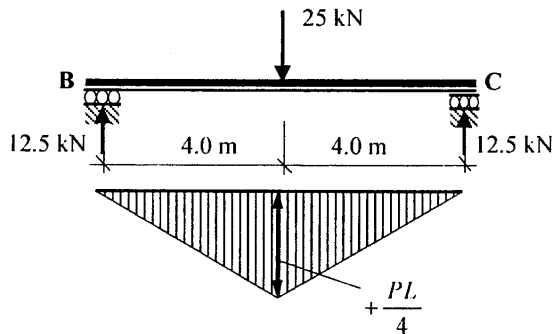
Moment Distribution Table:

| Joint | A | B | | C |
|----------------------|-------|--------|--------|--------|
| | AB | BA | BC | CB |
| Distribution Factors | 0 | 0.44 | 0.56 | 0 |
| Fixed-end Moments | | | - 25.0 | + 25.0 |
| Balance | | + 11.0 | + 14.0 | |
| Carry-over | + 5.5 | | | + 7.0 |
| Total | + 5.5 | + 11.0 | - 11.0 | + 32.0 |

Continuity Moments:



Free bending moment:



Member BC:

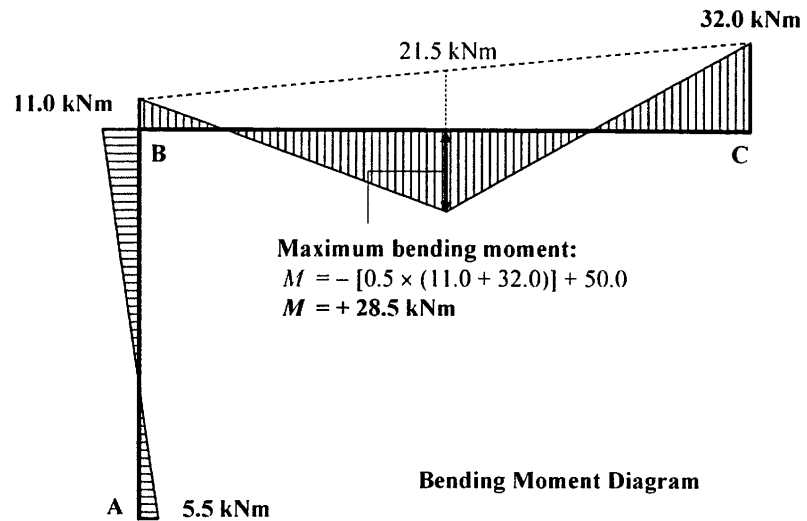
$$M_{\text{free}} = \frac{PL}{4} = \frac{25 \times 8}{4} = 50.0 \text{ kNm}$$

Solution

Topic: Moment Distribution – No-Sway Rigid-Jointed Frames

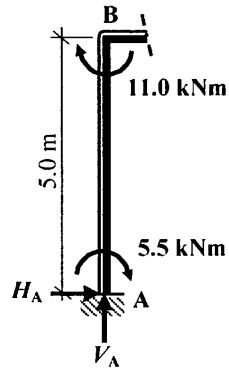
Problem Number: 5.5

Page No. 3



Maximum bending moment:
 $M = -[0.5 \times (11.0 + 32.0)] + 50.0$
 $M = +28.5 \text{ kNm}$

Consider Member AB:



$$+ve \curvearrowright \Sigma M_B = 0$$

$$+ 5.5 + 11.0 - (H_A \times 5.0) = 0 \quad \therefore H_A = +3.3 \text{ kN} \rightarrow$$

For the complete frame:

$$+ve \rightarrow \Sigma F_x = 0$$

$$3.3 + H_C = 0 \quad \therefore H_C = -3.3 \text{ kN} \leftarrow$$

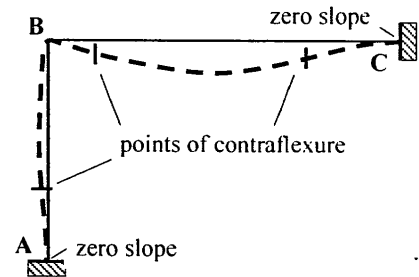
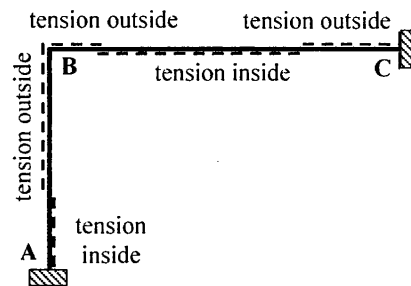
$$+ve \curvearrowright \Sigma M_A = 0$$

$$+ 5.5 + (25.0 \times 4.0) - (3.3 \times 5.0) + 32.0 - (V_C \times 8.0) = 0$$

$$\therefore V_C = +15.13 \text{ kN} \uparrow$$

$$+ve \uparrow \Sigma F_y = 0$$

$$V_A - 25.0 + 15.13 = 0 \quad \therefore V_A = +9.87 \text{ kN} \uparrow$$



Deflected Shape