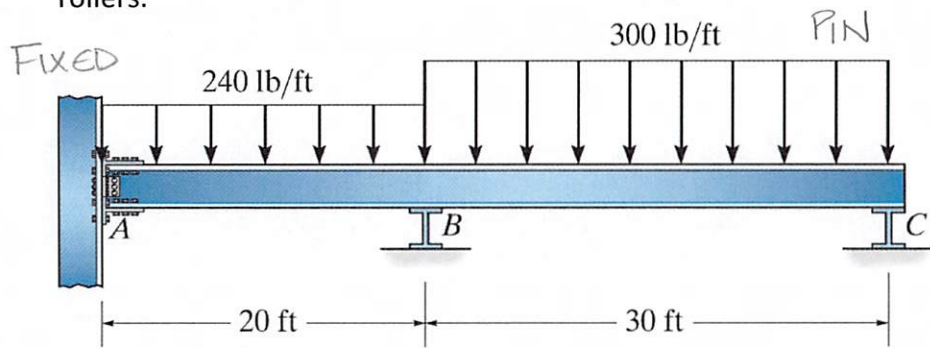


Problem 10-10 – Determine the moments at A, B, and C. The support at B settles 0.15 ft. Assume $E = 29(10^3)$ ksi, $I = 8,000$ in⁴, A is fixed, and B and C are rollers. 1/3



$$FEM_{AB} = -\frac{WL^2}{12} = -\frac{240 \text{ lb/ft} (20')^2}{12} = -8 \text{ kft}$$

$$FEM_{BA} = \frac{WL^2}{12} = 8 \text{ kft}$$

$$FEM_{BC} = -\frac{WL^2}{8} = -\frac{(300 \text{ lb/ft})(30')^2}{8} = -33.75 \text{ kft}$$

$$M_{AB} = \frac{2EI}{20 \text{ ft}} [\theta_B - 3\psi_{AB}] - 8 \text{ kft} \quad (1)$$

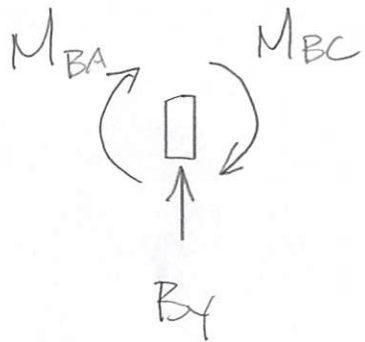
$$\psi_{BA} = \frac{0.15 \text{ ft}}{20 \text{ ft}} = 0.0075$$

$$M_{BA} = \frac{2EI}{20 \text{ ft}} [2\theta_B - 3\psi_{BA}] + 8 \text{ kft} \quad (2)$$

$$\psi_{BC} = \frac{-0.15 \text{ ft}}{30 \text{ ft}} = -0.005$$

$$M_{BC} = \frac{3EI}{30 \text{ ft}} [\theta_B - \psi_{CB}] - 33.75 \text{ kft} \quad (3)$$

JOINT B



$$\begin{aligned} \sum M_B &= 0 \\ &= -M_{BA} - M_{BC} \end{aligned}$$

$$M_{BA} + M_{BC} = 0 \quad (4)$$

Problem 10-10 – Determine the moments at A, B, and C. The support at B settles 0.15 ft. Assume $E = 29(10^3)$ ksi, $I = 800 \text{ in}^4$, A is fixed, and B and C are roller.

$$\textcircled{4} \quad M_{BA} + M_{BC} = 0 = \frac{2EI}{20 \text{ ft}} \left[2\theta_B - 3(0.0075) \right] + 8 \text{ kft} \\ + \frac{3EI}{30 \text{ ft}} \left[\theta_B - (-0.005) \right] - 33.75 \text{ kft}$$

$$\Rightarrow 0.3 \theta_B = \frac{25.75 \text{ kft}^2}{EI} + 0.00175$$

$$\frac{25.75 \text{ kft}^2}{29,000 \text{ k} \cdot 800 \text{ in}^4} \cdot \frac{\text{in}^2}{\text{ft}^2} \cdot \frac{(12 \text{ in})^2}{\text{ft}^2} \\ = 1.5983 \times 10^{-4}$$

$$\Rightarrow \underline{\underline{\theta_B = 5.8866 \times 10^{-3}}}$$

$$EI = \frac{29,000 \text{ k}}{\text{in}^2} \cdot 800 \text{ in}^4 \cdot \frac{\text{ft}^2}{(12 \text{ in})^2} \\ = \underline{\underline{1.6111 \times 10^6 \text{ kft}^2}}$$

Problem 10-10 – Determine the moments at A, B, and C. The support at B settles 0.15 ft. Assume $E = 29(10^3)$ ksi, $I = 800$ in⁴, A is fixed, and B and C are roller.

$$M_{AB} = \frac{2EI}{20\text{ft}} \left[\theta_B - 3(0.0075) \right] - 8\text{kft} = \underline{-2,685\text{ kft}}$$

$$M_{BA} = \frac{2EI}{20\text{ft}} \left[2\theta_B - 3(0.0075) \right] + 8\text{kft} = \underline{-1,720\text{ kft}}$$

$$M_{BC} = \frac{3EI}{30} \left[\theta_B + 0.005 \right] - 33.75\text{kft} = \underline{1,720\text{ kft}}$$