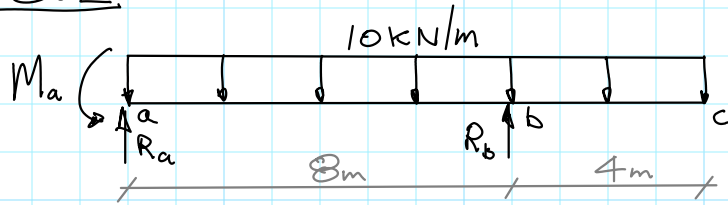


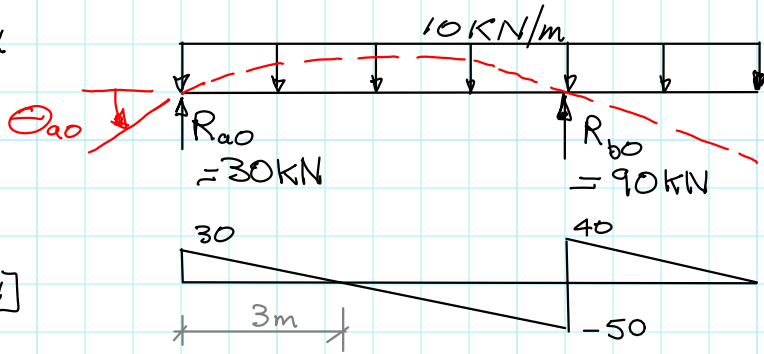
Problem 8.2

Real



1° S.I.
Choose M_a
as redundant

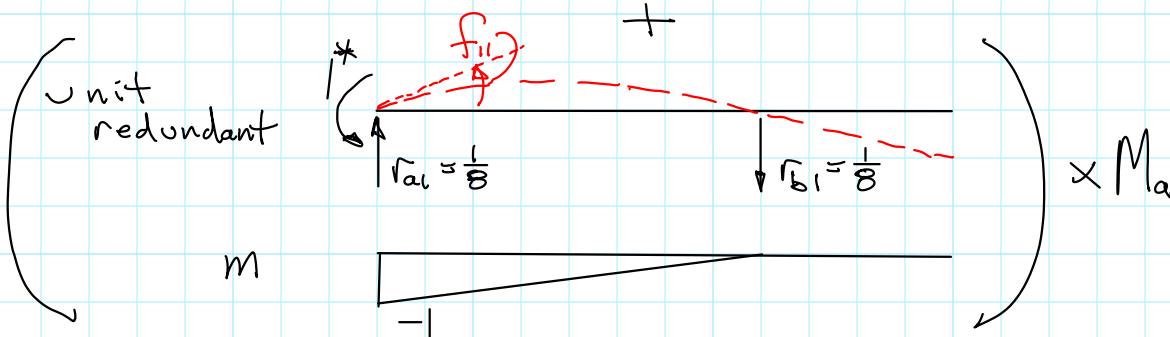
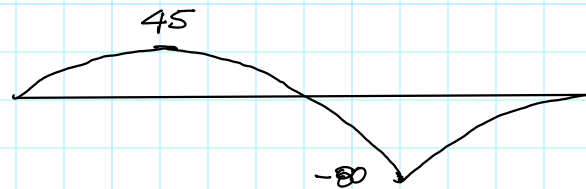
Primary



V
[kN]



M
[kN-m]



Displacement in Primary Structures:

$$\begin{aligned} \theta_{a0} &= \int \frac{mM}{EI} = \frac{1}{EI} \int \begin{matrix} 8 \\ -1 \end{matrix} \begin{matrix} \text{8} \\ -80 \end{matrix} \\ &= \frac{1}{EI} \frac{8m}{24} \left[-1(10 \times 8^2 + 4 \times -80) \text{ kNm} \right] \\ &= \frac{106.67 \text{ kNm}^2}{EI} \end{aligned}$$

Flexibility Coefficients:

2/3

$$f_{11} = \int \frac{m m}{EI} = \frac{1}{EI} \int \left(\frac{8m}{-1} \right)^2$$
$$= \frac{1}{EI} \times \frac{8m}{3} \times -1 \times -1$$
$$f_{11} = \frac{8m}{3EI}$$

Compatibility Equn:

$$\theta_a = \theta_{a0} + M_a f_{11} = 0$$

$$-\frac{106.67 \text{ kN-m}^2}{EI} + M_a \frac{8m}{3EI} = 0$$

Solving:

$$M_a = \frac{3}{8m} \times 106.67 \text{ kN-m}^2$$

$$\underline{M_a = 40 \text{ kN-m}} \quad (\therefore \curvearrowright)$$

Superposition to find reactions:

$$R_a = R_{a0} + M_a r_{a1}$$
$$= 30 \text{ kN} + 40 \text{ kN-m} \times \frac{1}{8}$$

$$\underline{R_a = 35 \text{ kN}} \quad (\therefore \uparrow)$$

$$R_b = R_{b0} - M_a r_{b1}$$
$$= 90 \text{ kN} - 40 \text{ kN-m} \times \frac{1}{8}$$

$$\underline{R_b = 85 \text{ kN}} \quad (\therefore \uparrow)$$

