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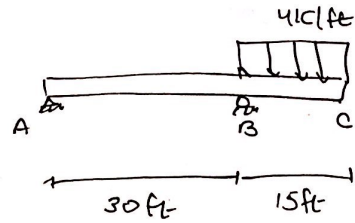
ID 7480

Subject Structural Analysis I

Teacher Engr Amjad Islam

Assignment Conjugate Beam

Q1)



Using the $\frac{M}{EI}$ diagram & Elastic Curve shown

$$\theta_c = \left| \theta_c \right| = \frac{1}{2} \left(\frac{4 \times 45}{EI} \right) (45) + \frac{2(4)(45)}{EI} (45) + \frac{1}{2} \left(\frac{4 \times 45}{EI} \right) (45) = \frac{1}{EI} (4050) + (16200 + 4050)$$

$$\theta_c = \frac{24300}{EI} \text{ rad}$$

$$\Delta_c = \left| \frac{\Delta_c}{A} \right| = \left[\frac{1}{2} \left(\frac{4 \times 45}{EI} \right) (45) \right] \left[45 + \frac{2}{3} (45) \right] + \left[\frac{2(4)(45)}{EI} (45) \right]$$

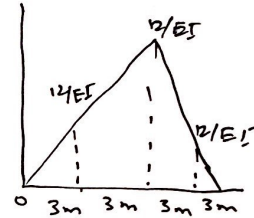
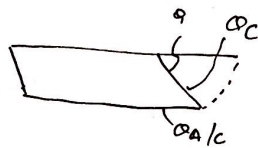
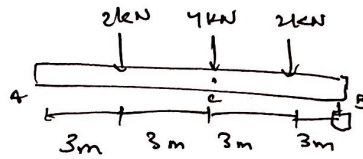
$$\left(45 + \frac{45}{2} \right) + \left[\frac{1}{2} \left(\frac{4 \times 45}{EI} \right) (45) \right] \left(\frac{2}{3} (45) \right) = 0$$

$$= \left[\frac{8100}{2EI} \right] [75] + \left(\frac{16200}{EI} \right) (67.5) + \left(\frac{8100}{2EI} \right) (30)$$

$$\Delta C = \frac{607500 + 1653500 + 24300}{6EI}$$

$$\Delta C = \frac{1944000}{6EI}$$

Q2



$$\theta_{A/c} = \frac{1}{2} \left(\frac{12}{EI} \right) 3 \left(\frac{6}{EI} \right) 3 + \frac{1}{2} \left(\frac{6}{EI} \right) (3)$$

$$\theta_{A/c} = \frac{18}{EI} + \frac{36}{EI} + \frac{9}{EI}$$

$$\theta_{A/c} = \frac{63}{EI} \quad \text{Putting the values}$$

$$\theta_{A/c} = \frac{63}{(200 \times 10^4) (6 \times 10^4) (1000)^{-4}} = \frac{63}{1200}$$

$$\theta_{A/c} = 0.0525 \text{ radian}$$

$$\theta_B = 0.0515 \text{ rad}$$

$$\begin{aligned} \delta_{A/c} &= \left[\frac{1}{2} \left(\frac{12}{EI} \right) (3) \right] \left[\frac{2}{3} (3) \right] + \left[\frac{12}{EI} (3) \right] \left(3 + \frac{1}{2} (3) \right) \\ &+ \left[\frac{1}{2} \left(\frac{6}{EI} \right) (3) \right] \left[3 + \frac{2}{3} (3) \right] = 0.202 \text{ m} \end{aligned}$$

$$\Delta C = L/AK = 0.202$$

$$\Delta C = 202 \text{ mm Ans}$$