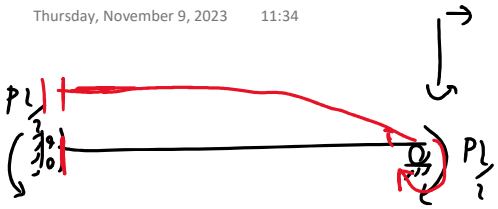
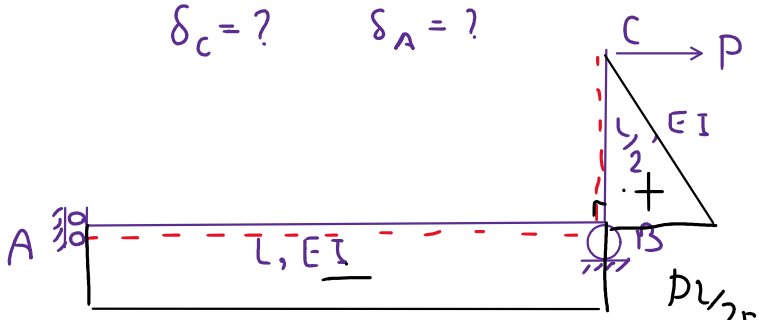
Deflections4

Thursday, November 9, 2023 11:34



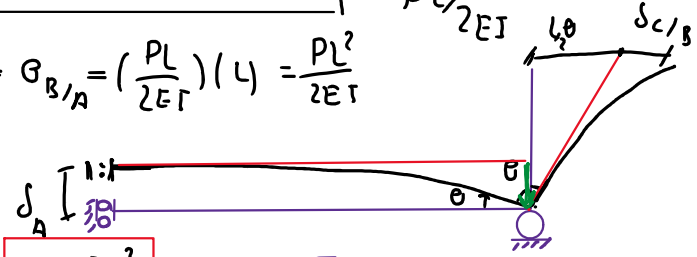
$\delta_C = ?$ $\delta_A = ?$



$$\delta_A = \delta_{B/A} = \left(\frac{PL}{2EI}\right)(L)\left(\frac{L}{2}\right) = \boxed{\frac{PL^3}{4EI}}$$

$$\theta_B = \theta_{B/A} = \left(\frac{PL}{2EI}\right)(L) = \frac{PL^2}{2EI}$$

$$\delta_C = L\theta_B + \delta_{C/B} = \frac{L}{2}\left(\frac{PL^2}{2EI}\right) + \frac{1}{2}\left(\frac{PL}{2EI}\right)\left(\frac{L}{2}\right)\left(\frac{2}{3}\times\frac{L}{2}\right) = \frac{6+1}{24} = \boxed{\frac{7}{24}\frac{PL^3}{EI}}$$



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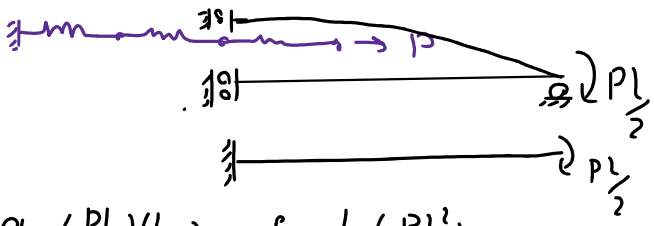
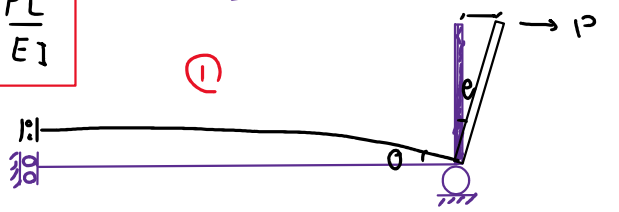


①



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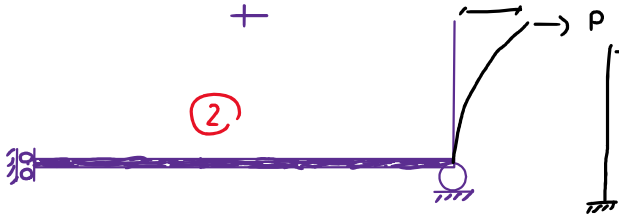
②

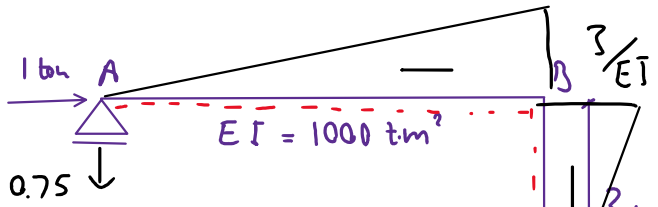


① $\theta = \left(\frac{PL}{2}\right)\left(\frac{L}{EI}\right)$, $\delta_C = \frac{L}{2}\left(\frac{PL^2}{2EI}\right)$

② $\delta_C = \frac{P\left(\frac{L}{2}\right)^3}{3EI}$

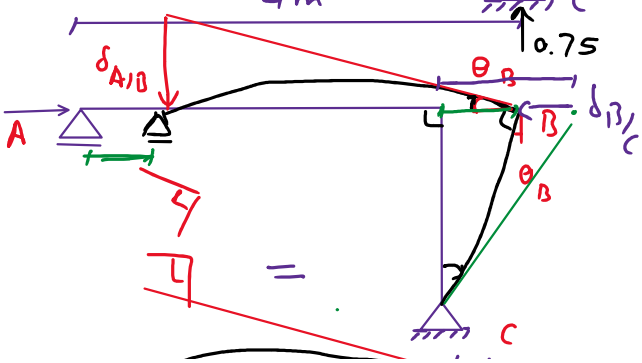
①+② $\delta_C = \frac{PL^3}{4EI} + \frac{PL^3}{24EI} = \frac{7}{24}\frac{PL^3}{EI}$

θ_C ، θ_B ، δ_A : أوجد



$$\delta_{A/B} = \frac{1}{2}\left(\frac{3}{EI}\right)(4)\left(\frac{2}{3}\times 4\right) = \frac{16}{EI}$$

$$\theta_B = \frac{16/EI}{4} = \frac{4}{EI}$$

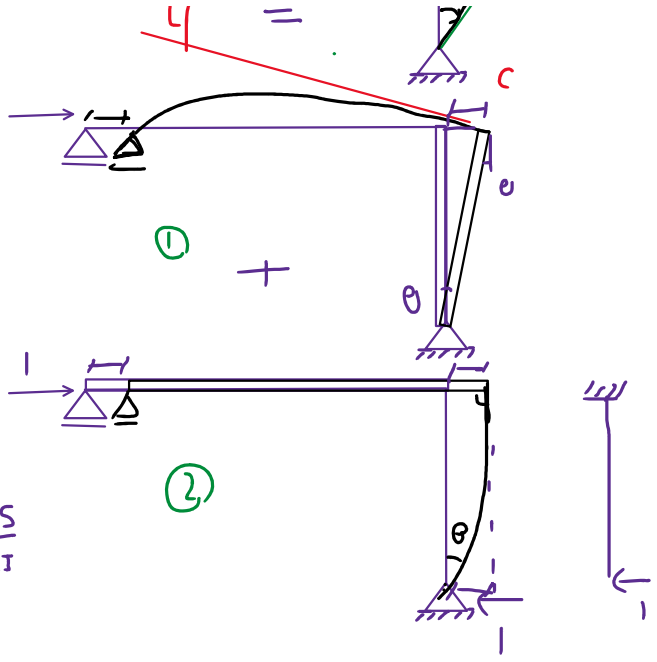


$$\theta_{C/B} = \theta_C - \theta_B = \frac{1}{2}\left(\frac{3}{EI}\right)(3) = \frac{4.5}{EI}$$

$$\theta_C - \left(\frac{-4}{EI}\right) = \frac{-4.5}{EI} \rightarrow \boxed{\theta_C = \frac{-8.5}{EI}}$$

$$\theta_C - \left(\frac{-4}{EI}\right) = \frac{-4.5}{EI} \rightarrow \boxed{\theta_C = \frac{-8.5}{EI}}$$

$$\delta_A = 3\left(\frac{8.5}{EI}\right) - \frac{1}{2}\left(\frac{3}{EI}\right)(3)(1) = \boxed{\frac{21}{EI}}$$



① $\theta_B = \frac{4}{EI}$ $\quad \delta_A = \frac{12}{EI}$ $\quad \theta_C = \frac{4}{EI}$

② $\theta_B = 0$ $\quad \delta_A = \frac{1 \times 3^3}{3EI} = \frac{9}{EI}$ $\quad \theta_C = \frac{1 \times 3^2}{2EI} = \frac{4.5}{EI}$

①+② $\theta_B = \frac{4}{EI}$ $\quad \delta_A = \frac{21}{EI}$ $\quad \theta_C = \frac{8.5}{EI}$