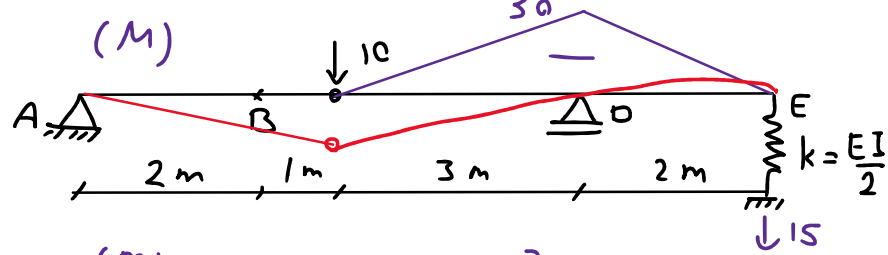


# Deflection Energy8

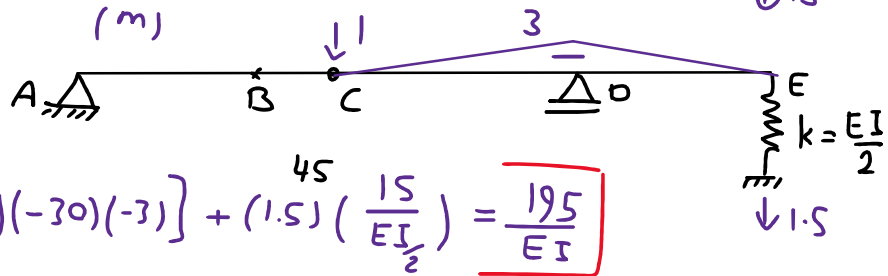
Sunday, December 10, 2023 13:05

$$1 \times \delta = \int \frac{mM}{EI} dx + \sum f \frac{F}{k} + \sum m \frac{M}{k_{\theta}}$$

مثال: تغییر مکان قائم B را بدست آورید.



$$1 \times \delta_c = \int \frac{mM}{EI} dx + f \frac{F}{k}$$



$$1 \times \delta_c = \frac{1}{EI} \left[ \left( \frac{3}{3} \right) (-30)(-3) + \left( \frac{2}{3} \right) (-30)(-3) \right] + (1.5) \left( \frac{15}{EI/2} \right) = \frac{195}{EI}$$

بار واحد

$$1 \times \delta_B = \int \frac{mM}{EI} dx = 0 + \left( \frac{L}{8} \right) \left( \frac{L}{4} \right) \left( \frac{PL}{4EI} \right) = \frac{PL^3}{96EI}$$

$$\delta_{C/A} = \frac{1}{2} \left( \frac{PL}{4EI} \right) \left( \frac{L}{2} \right) \left( \frac{L}{3} \right) = \frac{PL^3}{48EI}$$

$$\theta_A = \frac{\delta_{C/A}}{L} = \frac{PL^2}{48EI}$$

$$\delta_B = \theta_A \left( \frac{L}{2} \right) = \frac{PL^3}{96EI}$$

تیسر درج

$$\sum M_c = 0 \rightarrow R_A L - \frac{1}{2} \left( \frac{PL}{4EI} \right) \left( \frac{L}{2} \right) \left( \frac{L}{3} \right) = 0$$

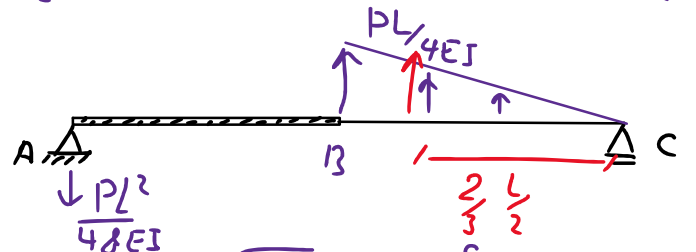
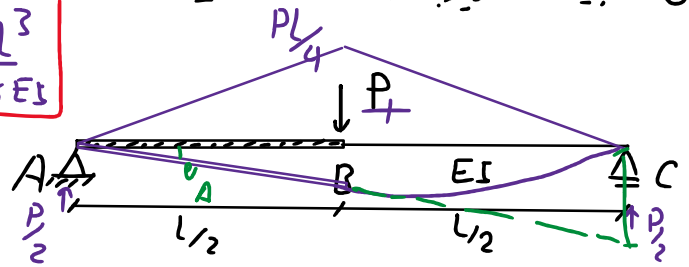
$$M_B = \left( \frac{PL^2}{48EI} \right) \left( \frac{L}{2} \right) = \frac{PL^3}{96EI}$$

$$1 \times \delta_{BL} = \int \frac{mM}{EI} dx + f \left( \frac{F}{k} \right)$$

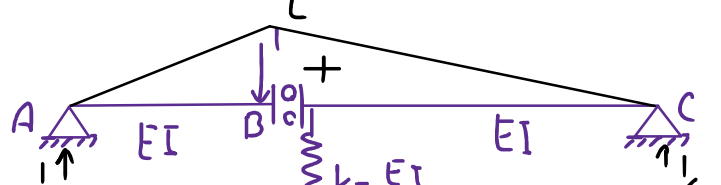
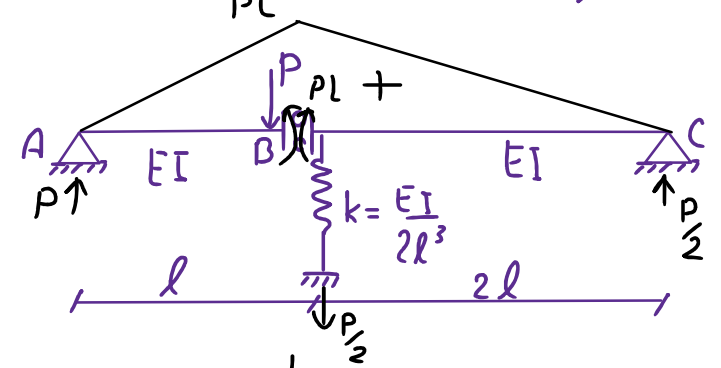
$$1 \times \delta_{BL} = \frac{1}{EI} \left[ \left( \frac{3L}{3} \right) (L) (PL) \right] + \left( \frac{1}{2} \right) \left( \frac{P/2}{EI} \right) =$$

$$\delta_{BL} = \frac{3}{2} \frac{PL^3}{EI}$$

مثال: تغییر مکان زیر بار را بدست آورید.



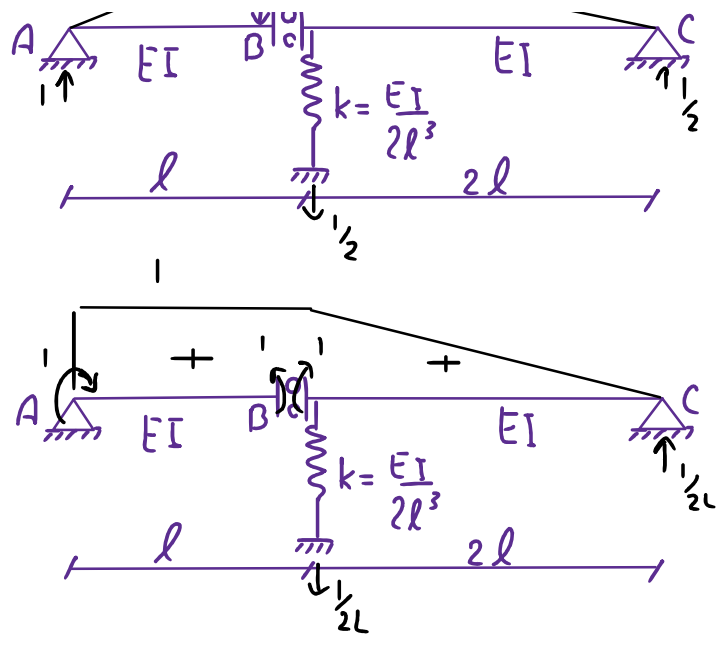
مثال:  $\theta_A$  و  $\delta_{BL}$  را بدست آورید.



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$$1 \times \theta_A = \int \frac{mM}{EI} dx + f\left(\frac{F}{k}\right)$$

$$1 \times \theta_A = \frac{1}{EI} \left[ (1) \frac{1}{2} (PL)(L) + \left(\frac{2L}{3}\right) (1)(PL) \right] + \left(\frac{1}{2L}\right) \left(\frac{P}{EI}\right) = \frac{5}{3} \frac{PL^2}{EI}$$



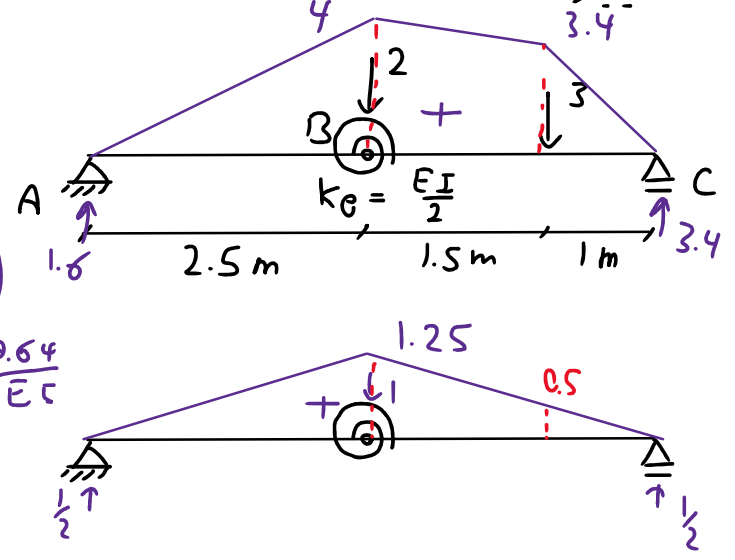
بار واحد

$$1 \times \delta_B = \int \frac{mM}{EI} dz + m\left(\frac{M}{k_\theta}\right)$$

$$\delta_B = \frac{1}{EI} \left[ \left(\frac{2.5}{3}\right) (1.25)(4) + \left(\frac{1.5}{6}\right) \left( (1.25)(4) + 4 \left(\frac{1.75}{2}\right) (3.7) + (0.5)(3.4) \right) + \left(\frac{1}{3}\right) (0.5)(3.4) \right] + (1.25) \left(\frac{4}{\frac{EI}{2}}\right) = \frac{19.64}{EI}$$

$$\delta_B = \frac{19.64}{EI}$$

مثال: تغییر مکان قائم B را بدست آورید.



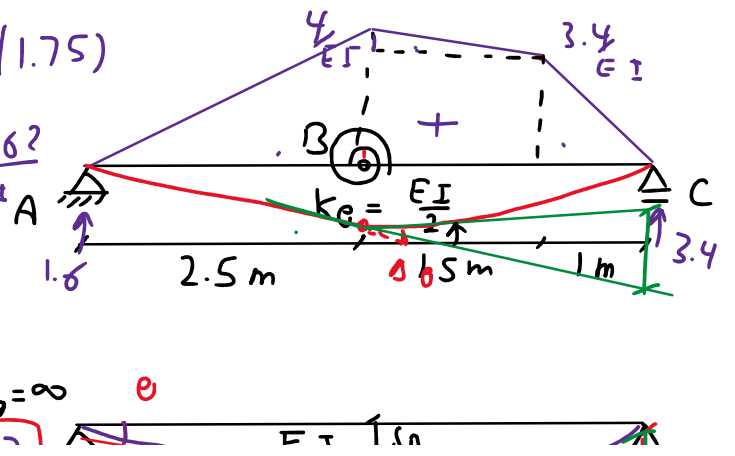
تشریح

$$\delta_{C/A} = \left(\frac{1}{2}\right) \left(\frac{4}{EI}\right) (2.5)(3.333) + \left(\frac{3.4}{EI}\right) (1.5)(1.75) + \frac{1}{2} \left(\frac{0.6}{EI}\right) (1.5)(2) + \frac{1}{2} \left(\frac{3.4}{EI}\right) (1) \left(\frac{2}{3}\right) = \frac{27.62}{EI}$$

$$\theta_A = \frac{\delta_{C/A}}{5} = \frac{5.52}{EI}$$

$$\delta_B = -2.5 \theta_A + \delta_{B/A} =$$

دلتا ص ۵۸  
مزدی ص ۵۷



$$d_B = -2.5\theta_A + \delta_{B/A} =$$

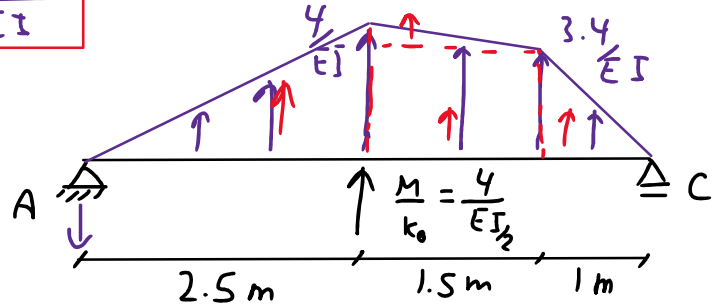
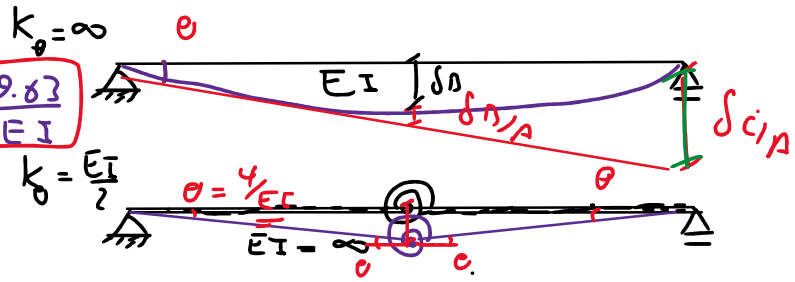
$$-2.5 \left( \frac{5.52}{EI} \right) + \frac{1}{2} \left( \frac{4}{EI} \right) (2.5) \left( \frac{2.5}{3} \right) = \frac{9.63}{EI}$$

$$\Delta\theta = \frac{M}{k_\theta} = \frac{4}{\frac{EI}{2}} = \frac{8}{EI}$$

$$\delta_B = 2.5\theta = 2.5 \left( \frac{4}{EI} \right) = \frac{10}{EI}$$

تیر مزدوج

$$\delta_B = \frac{19.63}{EI}$$



$$\sum M_C = 0$$

$$\left( \frac{1}{2} \right) \left( \frac{4}{EI} \right) (2.5) (3.333) + \left( \frac{3.4}{EI} \right) (1.5) (1.75)$$

$$+ \frac{1}{2} \left( \frac{0.6}{EI} \right) (1.5) (2) + \frac{1}{2} \left( \frac{3.4}{EI} \right) (1) \left( \frac{2}{3} \right) + \left( \frac{8}{EI} \right) (2.5) = R_A (5) \rightarrow R_A = \frac{9.52}{EI}$$

$$\delta_B = M_\rho = \frac{-9.52}{EI} (2.5) + \frac{1}{2} \left( \frac{4}{EI} \right) (2.5) \left( \frac{2.5}{3} \right) = \frac{19.64}{EI}$$