

$$\delta_{BR} = \frac{P/2}{EI} = \frac{PL^3}{EI}$$

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

$$\theta_c = \frac{1}{2L} \left(\frac{PL^3}{EI} - \frac{2}{3} \frac{PL^3}{EI} \right) = -\frac{PL^2}{6EI}$$

$$\theta_{C/B} = \theta_c - \theta_B = \frac{PL^2}{EI} \rightarrow \theta_B = -\frac{7}{6} \frac{PL^2}{EI}$$

$$\theta_{B/A} = \theta_B - \theta_A = \frac{PL^2}{2EI} \rightarrow \theta_A = -\frac{5}{3} \frac{PL^2}{EI}$$

کنترل سطح

$$\theta_A = \frac{\delta_{B/A}}{L} = \frac{1}{L} \int_0^L \frac{M}{EI} \bar{x} dx$$

معادله تعادل تیرانزیه

$$\sum M_B = 0$$

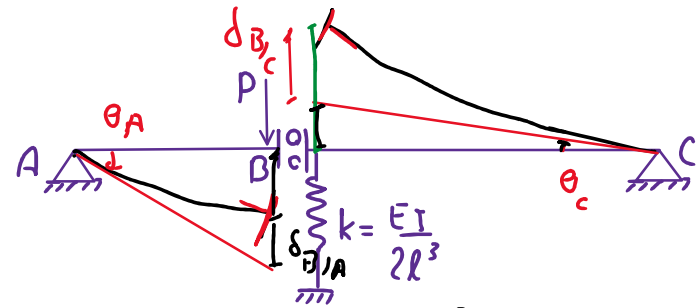
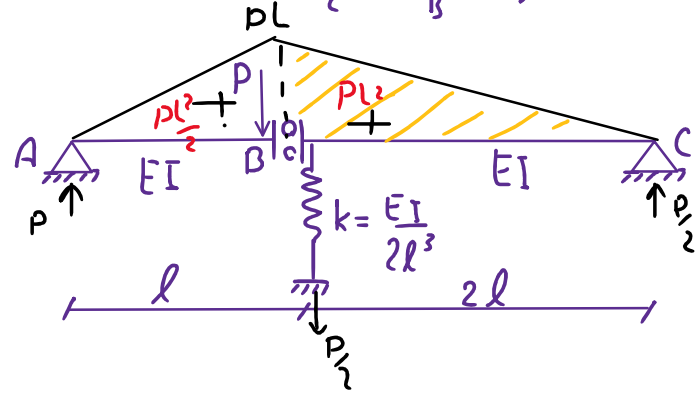
$$R_A(L) + \int_0^L \frac{M}{EI} \bar{x} dx \rightarrow R_A = -\frac{1}{L} \int_0^L \frac{M}{EI} \bar{x} dx$$

$$R_A = \theta_A$$

تیرانزیه

کنترل سطح

مثال: $\delta_{BL}, \theta_c, \theta_B, \theta_A$

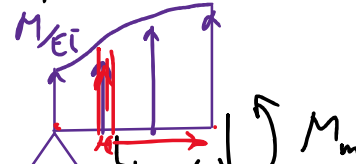
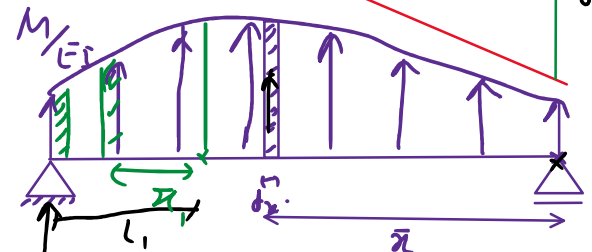
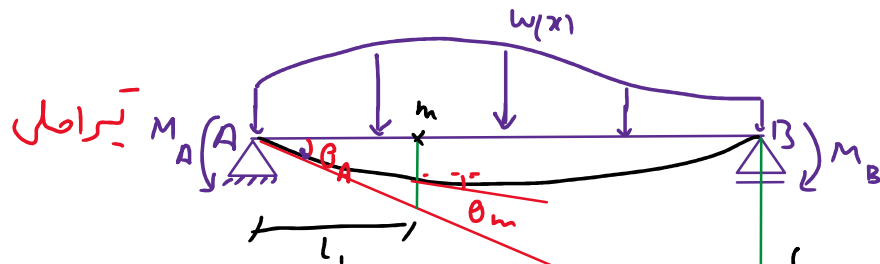


$$\delta_{B/A} = \left(\frac{PL^2}{2EI} \right) \left(\frac{L}{3} \right) = \frac{PL^3}{6EI}$$

$$\delta_{BL} = L \left(-\frac{5}{3} \frac{PL^2}{EI} \right) + \frac{PL^3}{6EI} = -\frac{3}{2} \frac{PL^3}{EI}$$

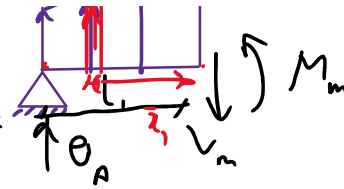
روش بارالاستیک

حالت خاص از روش تیر مزدوج است (برای تیر دوسریعی)



کنترل سطح

$$\theta_{m/A} = \theta_m - \theta_A = \int \frac{M}{EI} dx \rightarrow \theta_m = \theta_A + \int \frac{M}{EI} dx$$



برین در تیر تانویه

$$\sum F_y = 0 \rightarrow \theta_A + \int \frac{M}{EI} dx - V_m = 0 \rightarrow V_m = \theta_A + \int \frac{M}{EI} dx$$

$$V_m = \theta_m$$

تیر اصل
تیر تانویه

کنترل سطح

$$\delta_m = l_1 \theta_A + \delta_{m/A} = l_1 \theta_A + \int \frac{M}{EI} \bar{x}_1 dx$$

کنترل در تیر تانویه

$$M = \delta_m$$

تیر اصل
تیر تانویه

$$\delta_{m \times x} = M_{m \times x}$$

تیر تانویه
تیر اصل

$$\sum M_0 = 0$$

$$-4\theta_A + \frac{1}{2} \left(\frac{30}{EI} \right) (1.5)(3.5) + \left(\frac{30}{EI} \right) (1.5)(2.25) + \frac{1}{2} \left(\frac{7.5}{EI} \right) (1.5)(2) + \frac{1}{2} \left(\frac{37.5}{EI} \right) (1.5)(1) = 0$$

$$\theta_A = \frac{48.75}{EI}$$

$$\sum F_y = 0$$

$$-\frac{48.75}{EI} + \frac{1}{2} \left(\frac{30}{EI} \right) (1.5) + \frac{1}{2} \left(\frac{30}{EI} + \frac{30+5x}{EI} \right) x = 0 \rightarrow x = 0.819$$

$$M_m = -\frac{48.75}{EI} \times 2.319 + \frac{22.5}{EI} \times 1.319 + \frac{30}{EI} \frac{0.819^2}{2} + \frac{1}{2} \left(\frac{5x \times 0.819}{EI} \right) \times \frac{0.819^2}{3} = \frac{-72.85}{EI}$$

