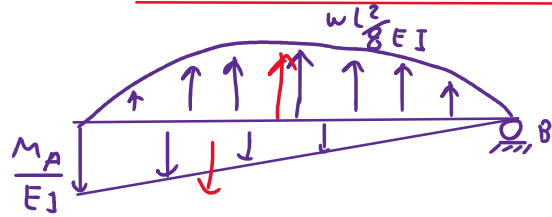
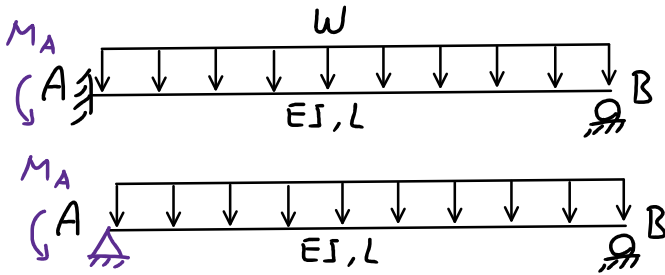


تحليل تيرناجين با معادلات تعادل تير مزدوج

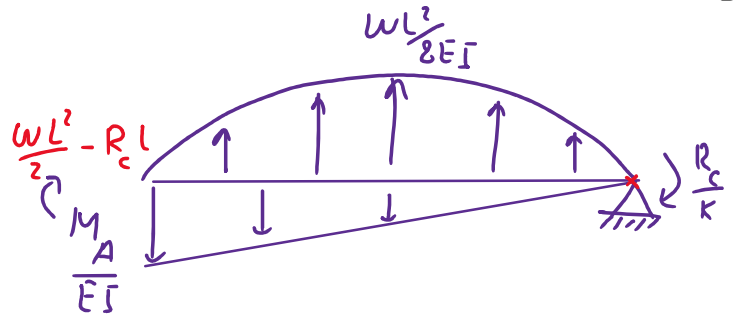
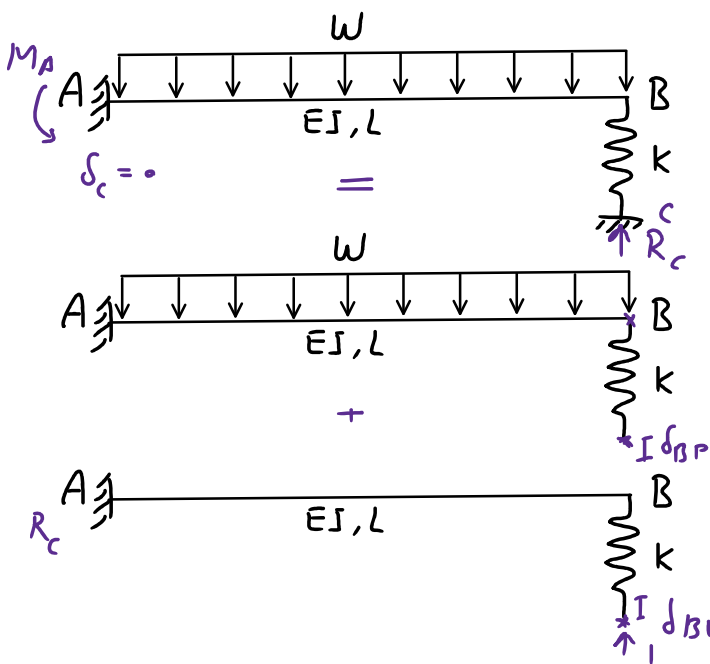


$\theta_A = 0$  تير اصل  $\rightarrow \sum M_B = 0$  تير مزدوج  $\rightarrow \frac{2}{3} \left( \frac{wL^2}{8EI} \right) (L) \left( \frac{L}{2} \right) - \frac{1}{2} \left( \frac{M_A}{EI} \right) (L) \left( \frac{2}{3} L \right) = 0$

$\frac{wL^4}{24EI} = \frac{1}{3} \frac{M_A L^2}{EI} \rightarrow M_A = \frac{wL^2}{8}$

\* در واقع به جای نوشتن معادلات گزلا w در تير اصل می توان معادلات تعادل در تير مزدوج را نوشت.

مثال: عکس العمل نه را بر روش گزلا تغییر شکل ها و معادلات تعادل تير مزدوج بدست آورید.



$\frac{2}{3} \left( \frac{wL^2}{8EI} \right) (L) \left( \frac{L}{2} \right) - \frac{1}{2} \left( \frac{wL^2}{2EI} - \frac{R_c L}{EI} \right) (L) \left( \frac{2}{3} L \right) + \frac{R_c}{k} = 0$

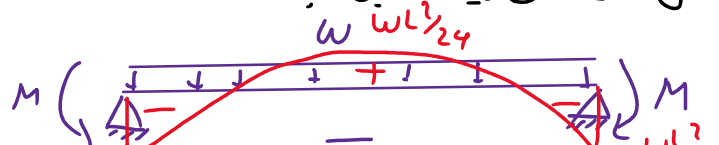
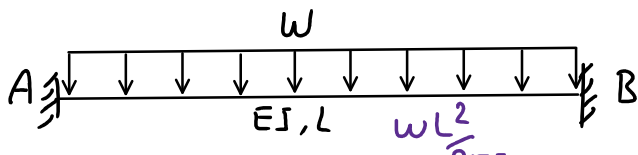
$\frac{1-4}{24} \frac{wL^4}{EI} = R_c \left( \frac{L^3}{3EI} + \frac{1}{k} \right)$

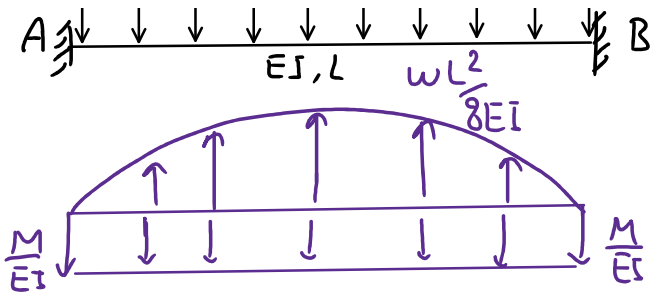
$R_c = \frac{3}{8} wL \frac{1}{\left( 1 + \frac{3EI}{L^3 k} \right)}$

$\delta_{Bp} + R_c \delta_{Bi} = 0$

$\frac{wL^4}{8EI} - \left( \frac{R_c L^3}{3EI} + \frac{R_c}{k} \right) = 0 \rightarrow R_c = \frac{\frac{3}{8} wL}{1 + \frac{3EI}{kL^3}}$

مثال: تير شکل زیر را تحلیل کنید.

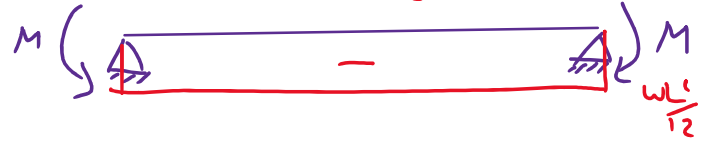
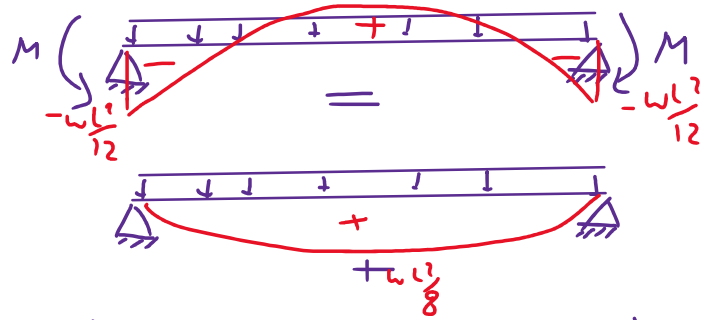




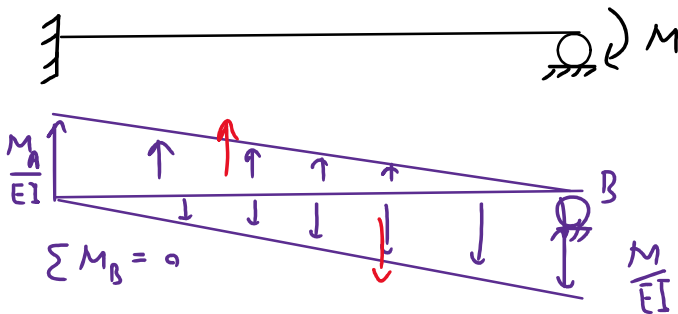
$$\sum F_y = 0$$

$$\frac{2}{3} \left( \frac{wL}{8EI} \right) (L) - \left( \frac{M}{EI} \right) (L) = 0$$

$$M_A = M_B = -\frac{wL^2}{12}$$



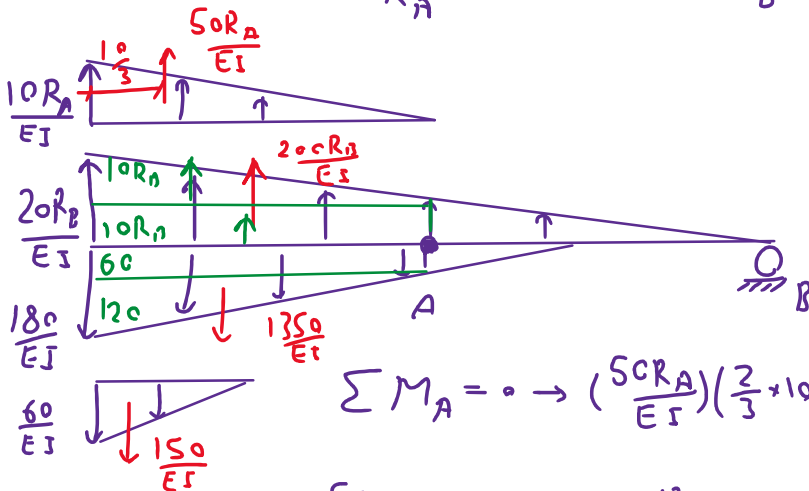
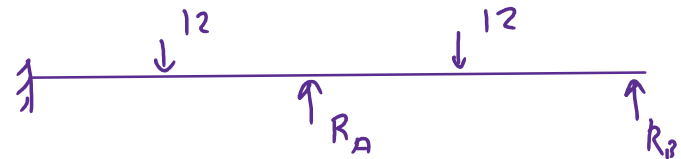
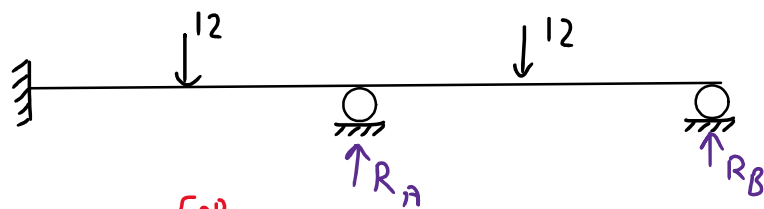
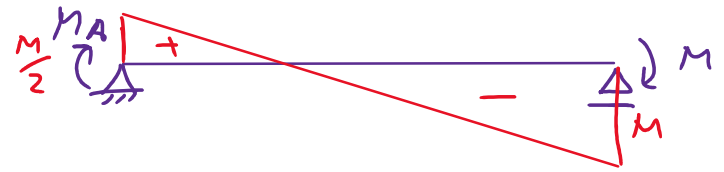
مثال :



$$\sum M_B = 0$$

$$\frac{1}{2} \left( \frac{M_A}{EI} \right) (L) \left( \frac{2}{3} L \right) - \frac{1}{2} \left( \frac{M}{EI} \right) (L) \left( \frac{L}{3} \right) = 0$$

$$M_A = \frac{M}{2}$$



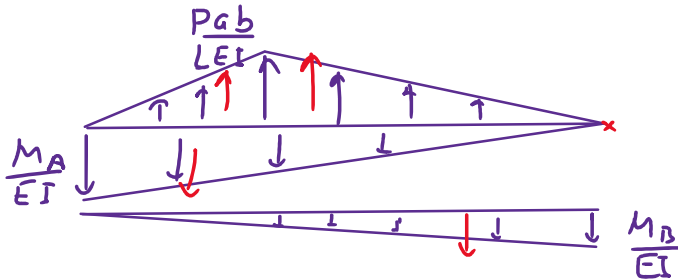
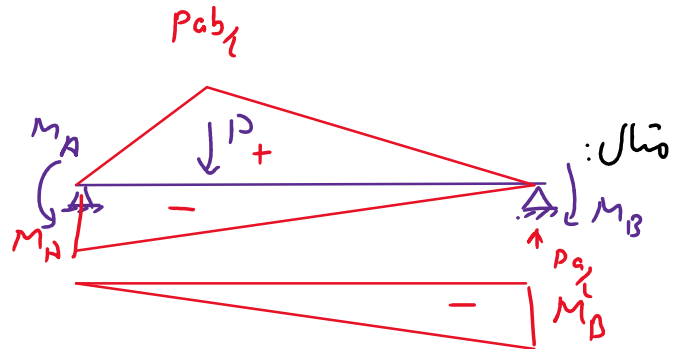
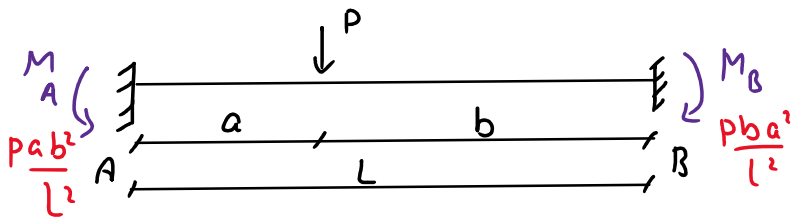
$$\sum M_A = 0 \rightarrow \left( \frac{50R_A}{EI} \right) \left( \frac{2}{3} \times 10 \right) + \left( \frac{10R_B}{EI} \right) (10) (5) + \frac{1}{2} \left( \frac{10R_B}{EI} \right) (10) \left( \frac{2}{3} \times 10 \right)$$

$$- \left[ \left( \frac{60}{EI} \right) (10) (5) + \frac{1}{2} \left( \frac{120}{EI} \right) (10) \left( \frac{2}{3} \times 10 \right) \right] - \left( \frac{150}{EI} \right) \left( \frac{25}{3} \right) = 0$$

$$* 333.33 R_A + 833.33 R_B - 8250 = 0$$

$$\Sigma M_D = 0 \rightarrow \left(\frac{50 R_A}{EI}\right)(16.67) + \left(\frac{200 R_B}{EI}\right)\left(\frac{2}{3} \times 20\right) - \left(\frac{1350}{EI}\right)(15) - \left(\frac{150}{EI}\right)(18.33) = 0$$

$$* 833.33 R_A + 2666.67 R_B - 23000 = 0$$



$$\Sigma F_y = 0 \rightarrow \frac{1}{2} \left(\frac{Pab}{LEI}\right)(L) - \frac{1}{2} \left(\frac{M_A}{EI}\right)(L) - \frac{1}{2} \left(\frac{M_B}{EI}\right)(L) = 0$$

$$\Sigma M_D = 0 \rightarrow \frac{1}{2} \left(\frac{Pab}{LEI}\right)(b) \left(\frac{2}{3}b\right) + \frac{1}{2} \left(\frac{Pab}{LEI}\right)(c) \left(b + \frac{a}{3}\right) - \left(\frac{M_A L}{2EI}\right) \left(\frac{2L}{3}\right) - \left(\frac{M_B L}{2EI}\right) \left(\frac{1}{3}L\right) = 0$$

$$\begin{cases} M_A + M_B = \frac{Pab}{L} \\ 2M_A + M_B = \frac{Pab}{L} + \frac{Pab^2}{L^2} \end{cases}$$

$$M_A = \frac{Pab^2}{L^2}$$

$$M_B = \frac{Pba^2}{L^2}$$

جبر نزیب

$$6 \times \frac{Pab}{L} \left(\frac{b^2}{3} + \frac{ab}{2} + \frac{a^2}{6}\right) \stackrel{2}{=} \frac{L^2}{3} (M_A + M_B)$$

$$\frac{Pcb}{L^3} (2b^2 + 3ab + a^2) = 2(M_A + M_B)$$

$$(a+b)^2 + b^2 + ab = L^2 + bl$$

$$\frac{Pab}{L^2} \times (L+b) = 2(M_A + \frac{M_B}{2})$$

$$Pcb^2 \quad Pcb \quad Pcb \quad L$$

$$-\frac{Pcb^2}{L^2} + \frac{Pcb}{L} = \frac{Pcb}{L} \left( \frac{1 - \frac{b}{L}}{\frac{L-b}{L}} \right) a$$