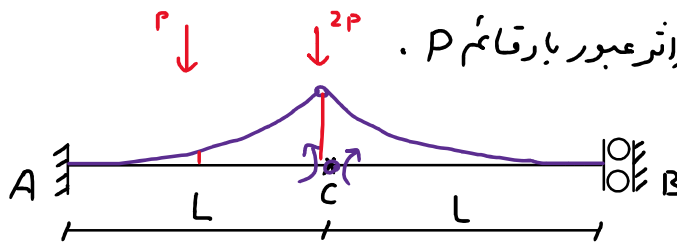
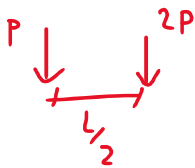
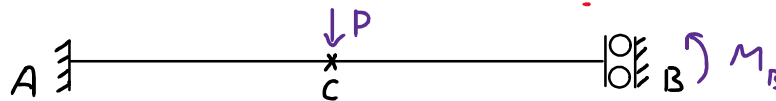


خط تأثیر زوهای نامعین

مثال: حداثر لنگر نقطه C در اثر عبور بار قائم P.

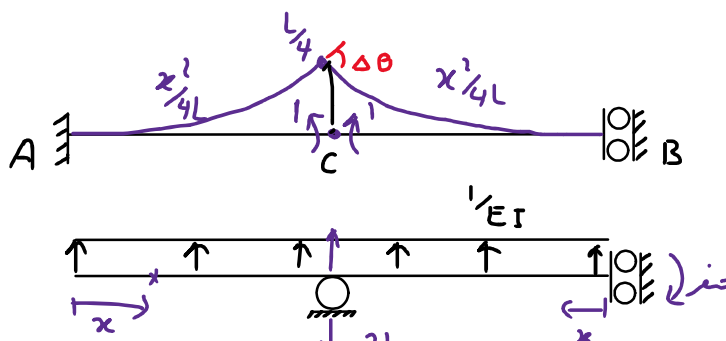


① شکل نهایت خط تأثیر و تحلیل سازه تحت بار مجزایی



$$\theta_B = 0 \rightarrow \frac{PL^2}{2EI} = \frac{M_B(2L)}{EI} \rightarrow M_B = \frac{PL}{4} \rightarrow \boxed{M_{C,max} = \frac{PL}{4}}$$

② اصل هولر- بیلاو



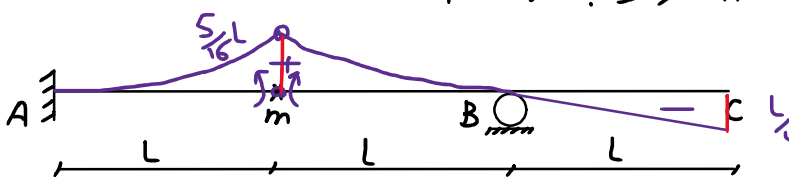
$$\left\{ \begin{array}{l} \delta_c = M_c = \frac{1}{EI} \frac{L^2}{2} \\ \Delta\theta = R_c = \frac{2L}{EI} \end{array} \right.$$

مزدیج اصلی  
مزدیج اصلی

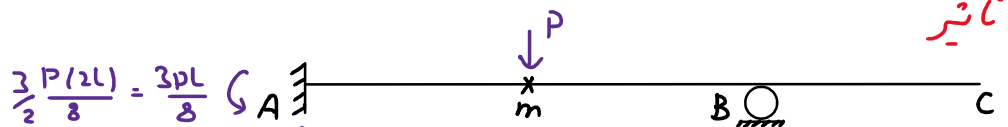
$$\rightarrow M_c = \frac{\delta_c}{\Delta\theta} = \frac{\frac{L^2}{2EI}}{\frac{2L}{EI}} = \frac{L}{4} \rightarrow \boxed{M_{C,max} = \frac{PL}{4}}$$

$$M_c = \frac{1}{EI} \frac{x^2}{2} = \frac{x^2}{4L}$$

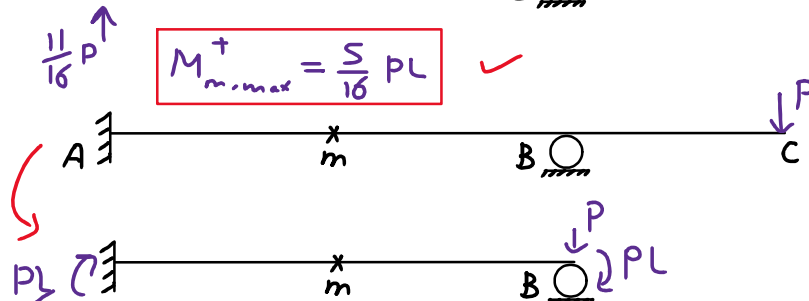
مثال: حداثر لنگر نقطه m در اثر عبور بار قائم P.

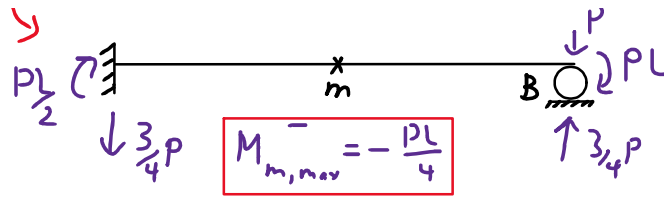


① شکل نهایت خط تأثیر

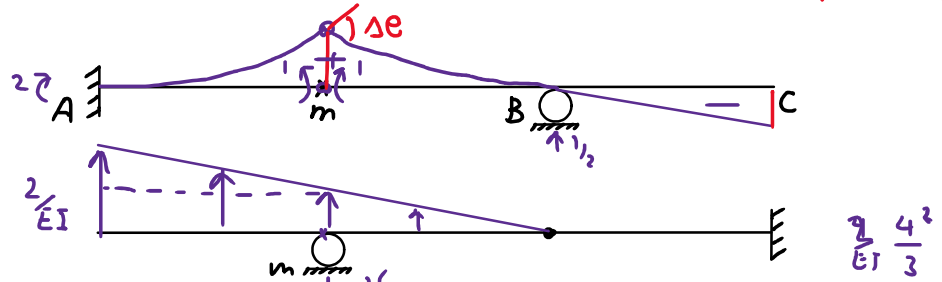


$$\boxed{M_{m,max} = \frac{5}{16} PL}$$



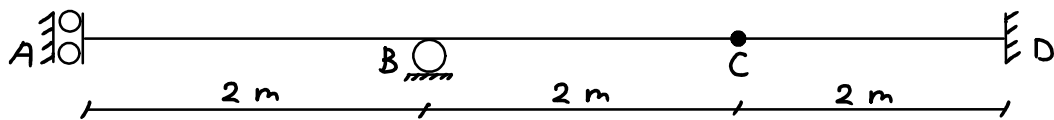


② اصل هولر- بیلاو

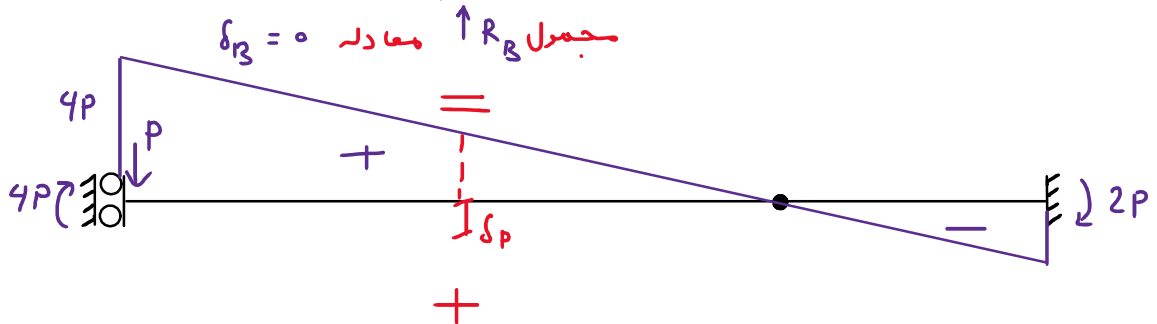
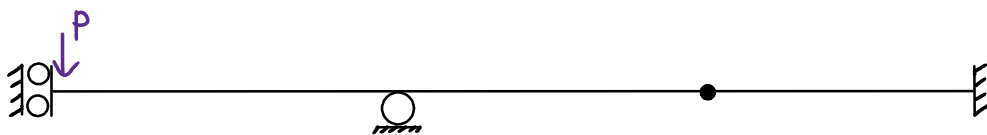
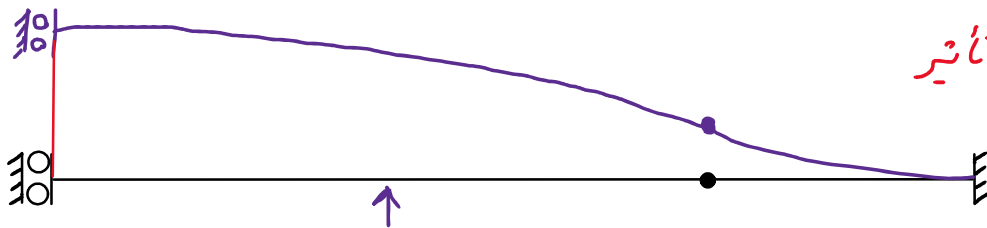


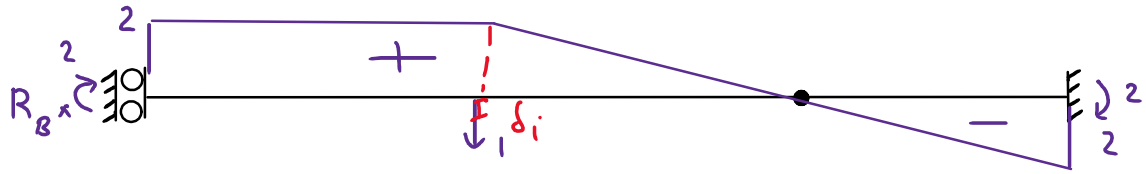
$$\left\{ \begin{array}{l} \delta_m = M_m = \frac{1}{EI} \left(\frac{L^2}{2}\right) + \frac{1}{EI} \left(\frac{L^2}{3}\right) = \frac{20}{6EI} \\ \Delta\theta = R_m = \frac{16}{3EI} \end{array} \right. \rightarrow M_m = \frac{\delta_m}{\Delta\theta} = \frac{\frac{10}{3}}{\frac{16}{3}} = \frac{5}{8} \rightarrow \frac{5}{16}L$$

مثال: حد اکثر عکس العمل تکیه گاه B در اثر عبور بار قائم P.



① شکل نهایت خط تأثیر



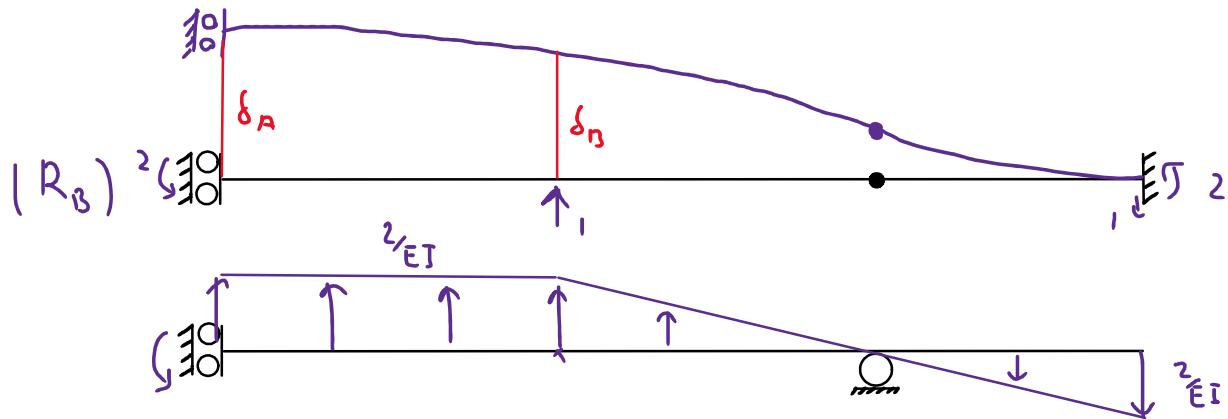


$$1 \times \delta_P = \int \frac{mM}{EI} dx = \frac{1}{EI} \left[ (2)(3P)(2) + \frac{2}{3} \times (2P)(2) \times 2 \right] = \frac{52}{3} \frac{P}{EI}$$

$$1 \times \delta_i = \int \frac{m^2}{EI} dx = \frac{1}{EI} \left[ (2^2)(2) + \frac{2}{3} \times (2^2) \times 2 \right] = \frac{40}{3EI}$$

$$\delta_B = 0 \rightarrow \delta_P + R_B \delta_i = 0 \rightarrow \frac{52}{3} \frac{P}{EI} + R_B \frac{40}{3EI} = 0 \rightarrow \boxed{R_B = -\frac{52}{40} P}$$

② اصل هولر- بریلاد



$$\left\{ \begin{array}{l} \delta_A = M_A = \left(\frac{2}{EI}\right)(2)(3) + \left(\frac{2}{EI}\right)\left(\frac{2^2}{3}\right) \times 2 = \frac{52}{3EI} \\ \delta_B = M_B = -\frac{52}{3EI} + \frac{2}{EI}\left(\frac{2^2}{2}\right) = -\frac{40}{3EI} \end{array} \right. \rightarrow R_B = \frac{\delta_A}{\delta_B} = \frac{\frac{52}{3}}{\frac{40}{1}} = \boxed{\frac{52}{40}}$$