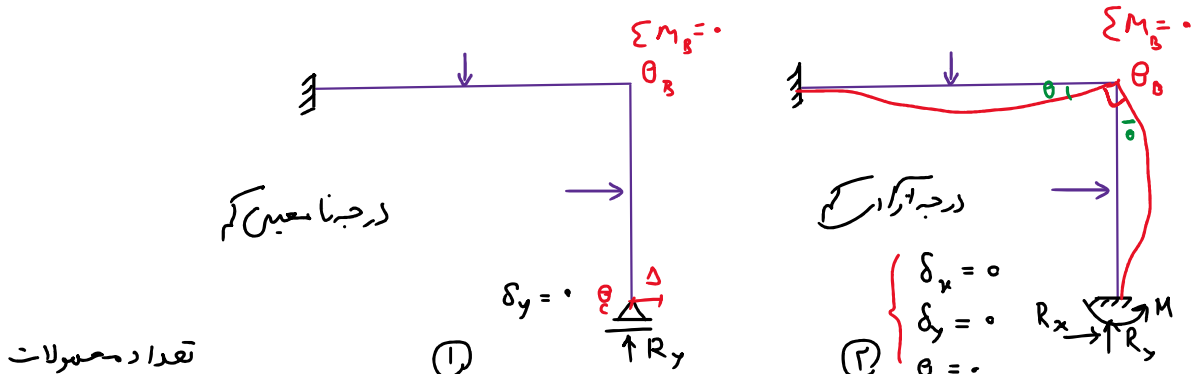
Slope-Deflection 2

Monday, February 19, 2024 8:25

یادآوری روش های تحلیل سازه های نامعین

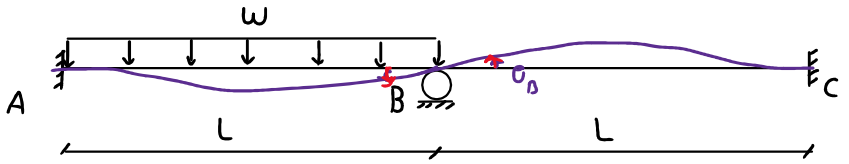
	مجهولات	معادلات
روش نیروی (نرم)	نیرو (M, F)	تغییرمکان (θ, Δ)
روش تغییرمکان (سخت)	تغییرمکان (θ, Δ)	نیرو (M, F)



تعداد مجهولات	①	②
M, F	۱	۳
θ, Δ	۳	۱
روش تحلیل	نرم	سخت

مثال: تیر شکل زیر را تحلیل نموده و دیاگرام لنگر و برش آن را رسم نمایید.

EI: Const.



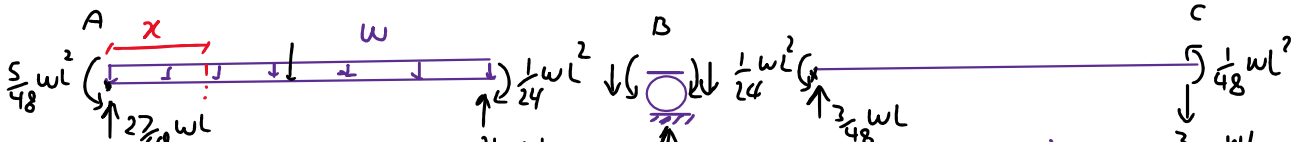
مجهول : θ_B معادله $\Sigma M_B = 0 \rightarrow M_{BA} + M_{BC} = 0$

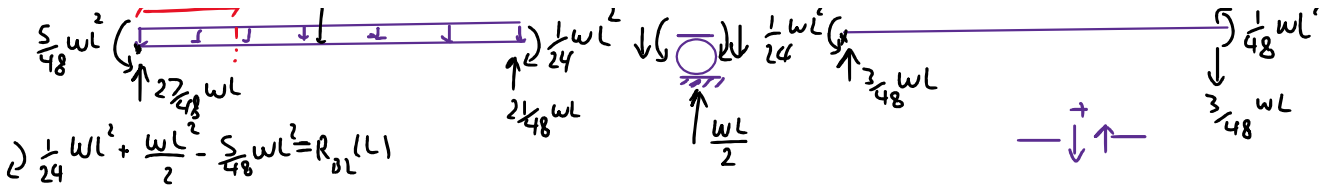
$$\begin{cases} M_{BA} = \frac{2EI}{L}(2\theta_B + \theta_A - \frac{3\Delta}{L}) + \frac{wL^2}{12} \\ M_{BC} = \frac{2EI}{L}(2\theta_B + \theta_C - \frac{3\Delta}{L}) \end{cases}$$

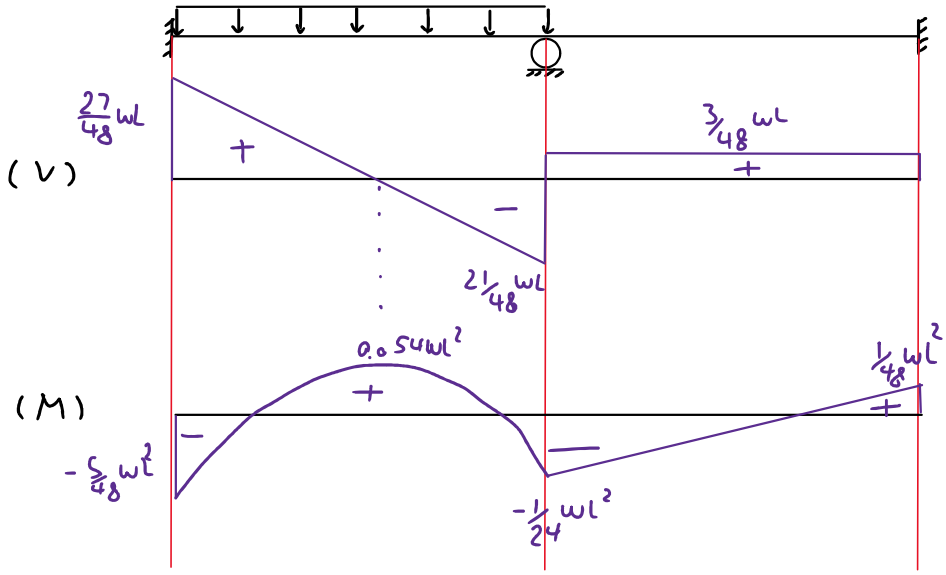
$$M_{BA} + M_{BC} = 0 \rightarrow \frac{8EI}{L}\theta_B + \frac{wL^2}{12} = 0 \rightarrow \boxed{\theta_B = -\frac{wL^3}{96EI}}$$

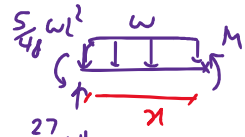
$$M_{AB} = \frac{2EI}{L}(\theta_B) - \frac{wL^2}{12} = -\frac{5}{48}wL^2 \qquad M_{BC} = \frac{2EI}{L}(2\theta_B) = -\frac{1}{24}wL^2$$

$$M_{BA} = \frac{2EI}{L}(2\theta_B) + \frac{wL^2}{12} = \frac{1}{24}wL^2 \qquad M_{CB} = \frac{2EI}{L}(\theta_B) = -\frac{1}{48}wL^2$$









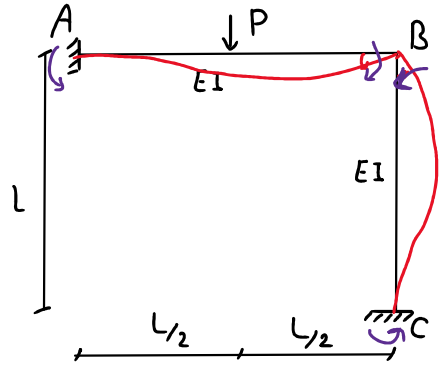
$\Sigma F_y = 0$

$\frac{27}{48}wL - wx = 0$

$x = \frac{27}{48}L$

$M = -\frac{5}{48}wL^2 - \frac{w}{2}\left(\frac{27}{48}L\right)^2 + \frac{27}{48}wL\left(\frac{27}{48}L\right) = 0.054wL^2$

مثال: لنگرهای انتهایی تیر دستون را به دست آورید.

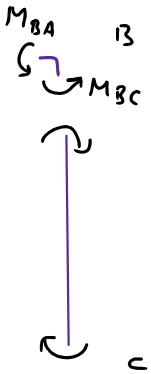


مجهول: θ_B معادله: $\Sigma M_B = 0$

$$\begin{cases} M_{BA} = \frac{2EI}{L}(2\theta_B) + \frac{PL}{8} \\ M_{BC} = \frac{2EI}{L}(2\theta_B) \end{cases}$$

$M_{BA} + M_{BC} = 0 \rightarrow \frac{8EI}{L}\theta_B + \frac{PL}{8} = 0$

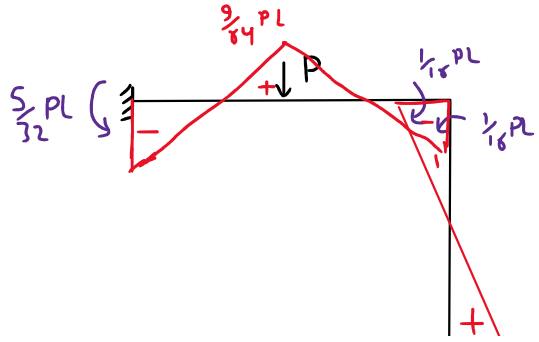
$\theta_B = -\frac{PL^2}{64EI}$

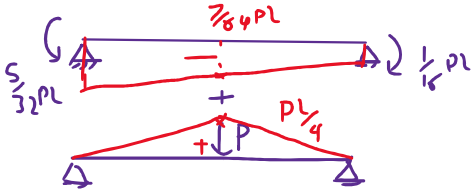


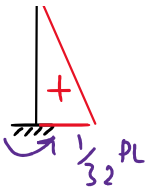
$$\begin{cases} M_{AB} = \frac{-5}{32}PL \\ M_{BA} = \frac{1}{16}PL \\ M_{BC} = \frac{-1}{16}PL \\ M_{CB} = -\frac{1}{32}PL \end{cases}$$

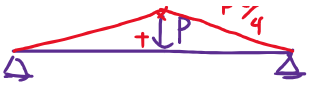
$M_{AB} = \frac{2EI}{L}(\theta_B) - \frac{PL}{8}$

$M_{CB} = \frac{2EI}{L}(\theta_B)$









$\frac{PL}{4} - \frac{7}{64}PL = \frac{9}{64}PL$