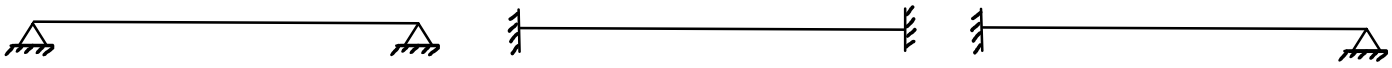
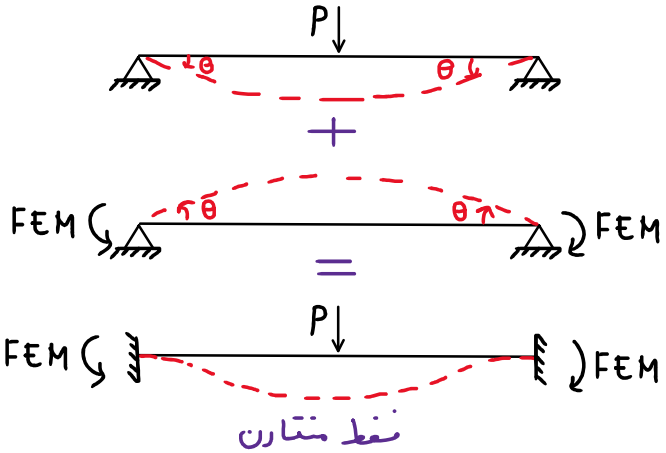
Symmetric Structures 7

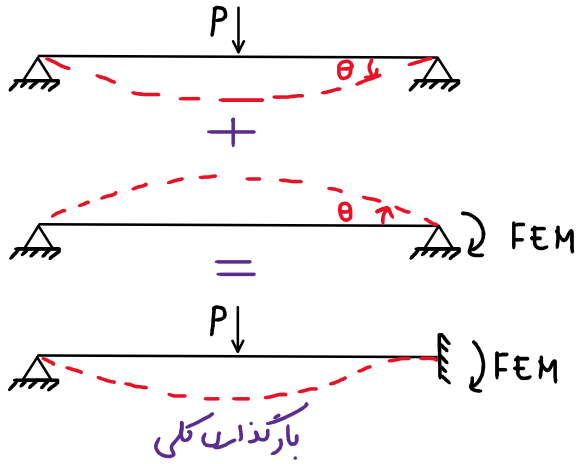
Sunday, May 12, 2024 8:58

# محاسبه تغییرشکل θ و Δ در تیرهای متداول

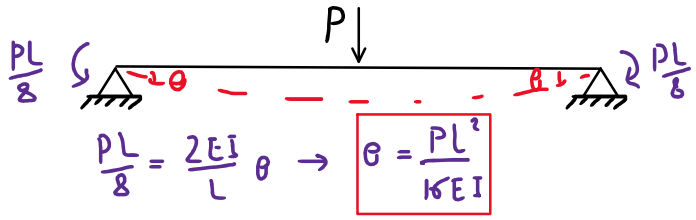


## روش محاسبه θ

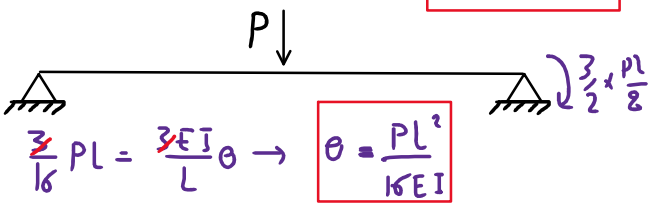


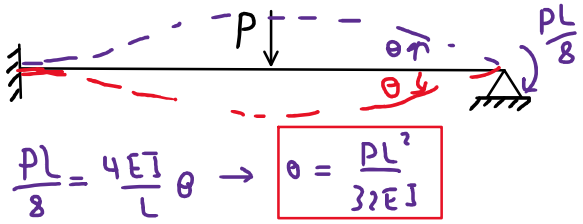

## محاسبه θ



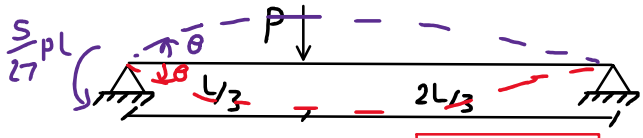

$$\frac{PL}{8} = \frac{2EI}{L}\theta \rightarrow \boxed{\theta = \frac{PL^2}{16EI}}$$




$$\frac{3}{16}PL = \frac{3EI}{L}\theta \rightarrow \boxed{\theta = \frac{PL^2}{16EI}}$$

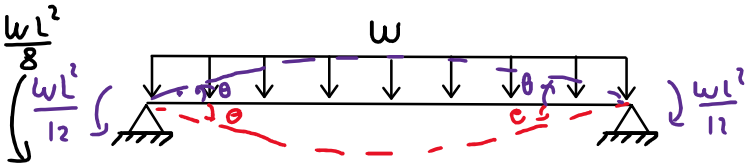



$$\frac{PL}{8} = \frac{4EI}{L}\theta \rightarrow \boxed{\theta = \frac{PL^2}{32EI}}$$



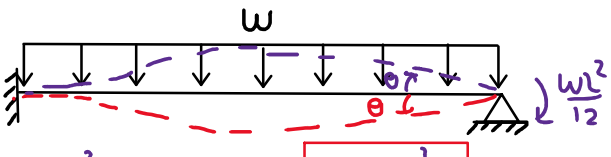

$$\frac{5}{27}PL = \frac{3EI}{L}\theta \rightarrow \boxed{\theta = \frac{5}{81}\frac{PL^2}{EI}}$$

$$\frac{P(\frac{L}{3})(\frac{2L}{3})^2}{L^2} = \frac{4}{27}PL \qquad \frac{P(\frac{2L}{3})(\frac{L}{3})^2}{L^2} = \frac{2}{27}PL$$

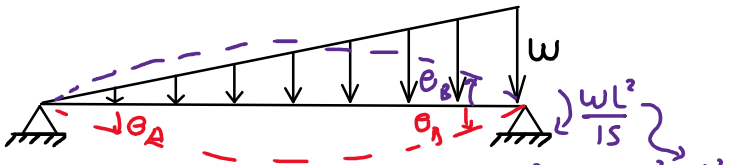



$$\frac{wL^2}{12} = \frac{2EI}{L}\theta \rightarrow \boxed{\theta = \frac{wL^3}{24EI}}$$

$$\frac{wL^2}{8} = \frac{3EI}{L}\theta \rightarrow \theta = \frac{wL^3}{24EI}$$

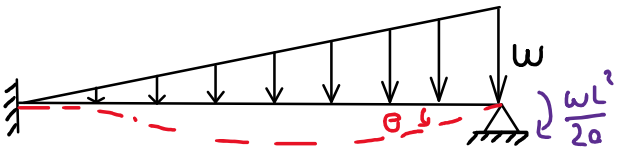



$$\frac{wL^2}{12} = \frac{4EI}{L}\theta \rightarrow \boxed{\theta = \frac{wL^3}{48EI}}$$



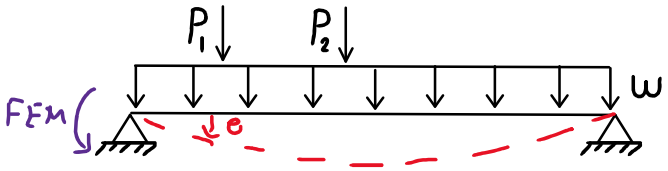

$\frac{wL^2}{15} = \frac{3EI}{L}\theta_B \rightarrow \theta_B = \frac{wL^3}{45EI}$

$\frac{wL^2}{20} + \frac{1}{2}\times\frac{wL^2}{30} = \frac{wL^2}{15}$




$\frac{wL^2}{20} = \frac{4EI}{L}\theta \rightarrow \theta = \frac{wL^3}{80EI}$

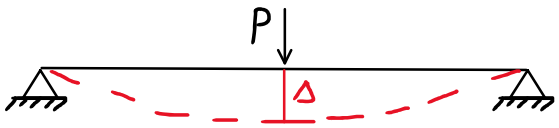
$\frac{7}{120}wL^2 = \frac{3EI}{L}\theta_A \rightarrow \theta_A = \frac{7}{360}\frac{wL^3}{EI}$




$FEM = \frac{3EI}{L}\theta$

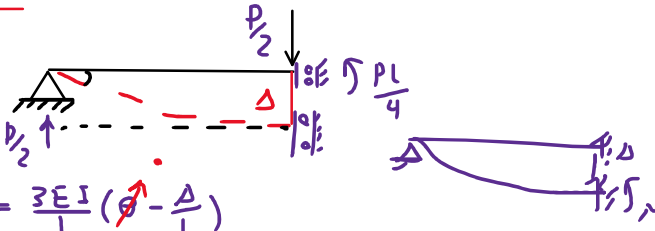
## محاسبه Δ

### روش محاسبه Δ



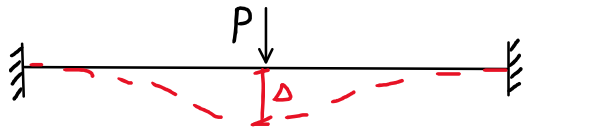

$\Delta = \frac{(\frac{P}{2})(\frac{L}{2})^3}{3EI} = \frac{PL^3}{48EI}$

$\theta = \frac{\frac{P}{2}(\frac{L}{2})^2}{2EI} = \frac{PL^2}{16EI}$

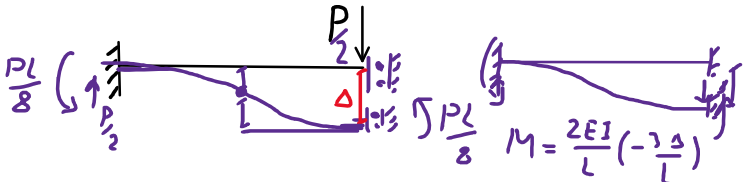



$M = \frac{3EI}{L}(\theta - \frac{\Delta}{L})$

$\frac{PL}{4} = \frac{3EI}{(\frac{L}{2})^2}\Delta \rightarrow \Delta = \frac{PL^3}{48EI}$

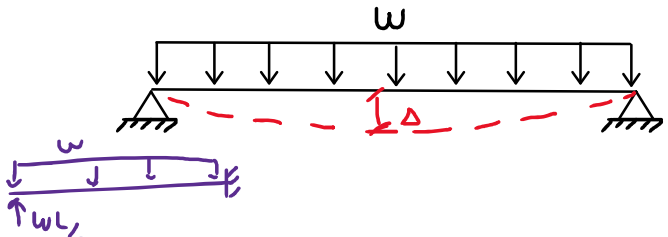



$\Delta = 2\times\frac{\frac{P}{2}(\frac{L}{4})^3}{3EI} = \frac{1}{192}\frac{PL^3}{EI}$

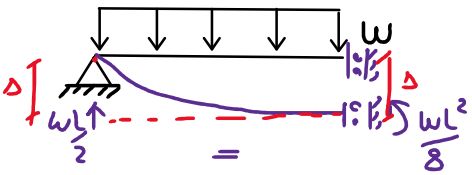


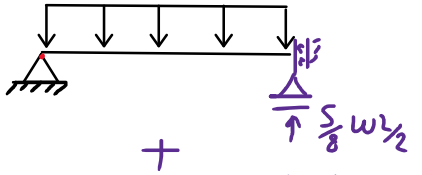

$M = \frac{2EI}{L}(-\frac{3\Delta}{L})$

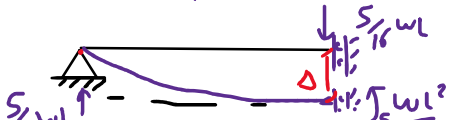
$\frac{PL}{8} = \frac{6EI}{(\frac{L}{2})^2}\Delta \rightarrow \Delta = \frac{1}{192}\frac{PL^3}{EI}$




$\Delta = \frac{(\frac{wL}{2})(\frac{L}{2})^3}{3EI} - \frac{w(\frac{L}{2})^4}{8EI} = \frac{8-3}{16\times3\times8}\frac{wL^4}{EI} = \frac{5}{384}\frac{wL^4}{EI}$

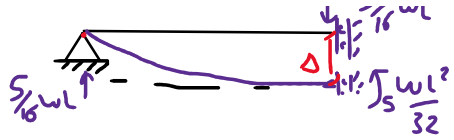


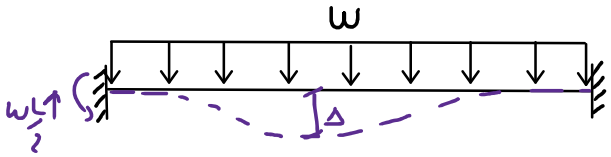



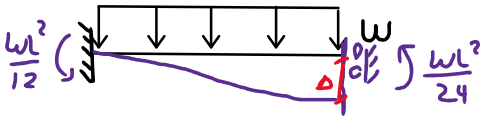




$\frac{5}{32}wL^2 = \frac{3EI}{(\frac{L}{2})^2}\Delta \rightarrow \Delta = \frac{5}{384}\frac{wL^4}{EI}$

$\frac{5wL^2}{32} = \frac{3EI}{(L/2)^2}\Delta \rightarrow \boxed{\Delta = \frac{5}{384}\frac{wL^4}{EI}}$



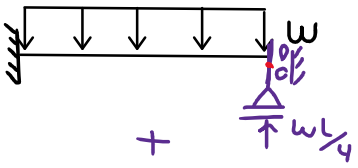




$\Delta = \frac{w(L/2)^4}{8EI} - \frac{wL^2}{24}\frac{(L/2)^2}{2EI} = \frac{1}{16\times 8} - \frac{1}{8\times 24} =$

$\frac{3-2}{16\times 24}$

$\boxed{\Delta = \frac{1}{384}\frac{wL^4}{EI}}$

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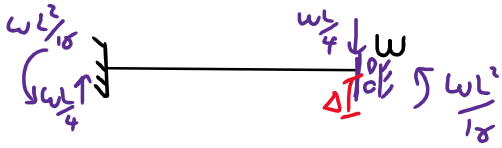


$\frac{wL}{4} = \frac{12EI}{(L/2)^3}\Delta \rightarrow \boxed{\Delta = \frac{1}{384}\frac{wL^4}{EI}}$

$\frac{wL^2}{16} = \frac{6EI}{(L/2)^2}\Delta \rightarrow \boxed{\Delta = \frac{1}{384}\frac{wL^4}{EI}}$