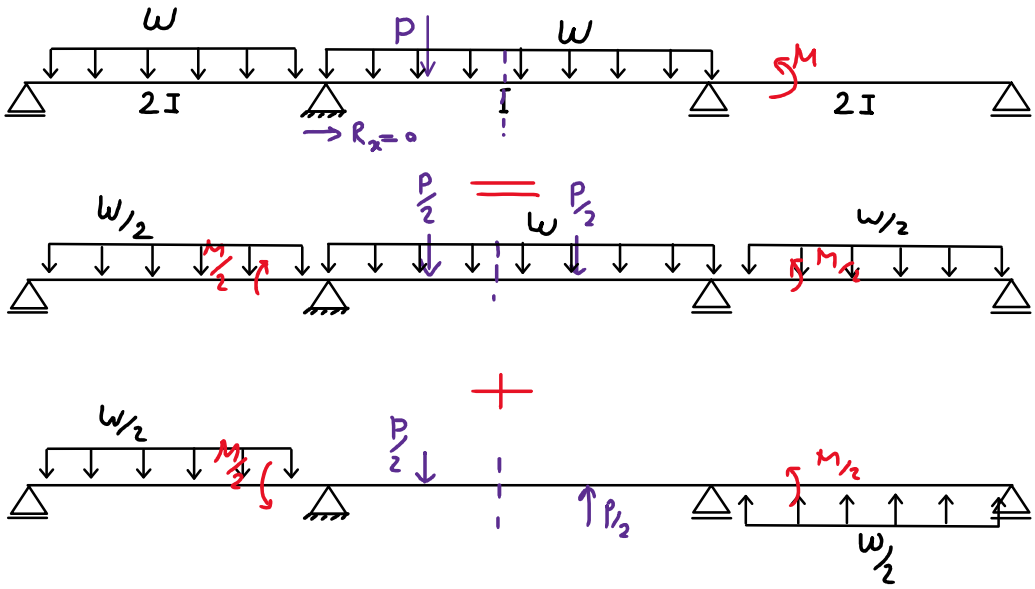
Symmetric Structures 3

Saturday, May 4, 2024 14:24

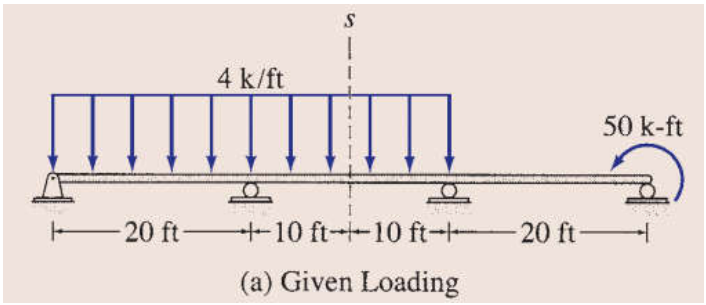
تفکیک یک بارگذاری کلی به یک بارگذاری متقارن و پادمتقارن

سازه متقارن با بارگذاری کلی

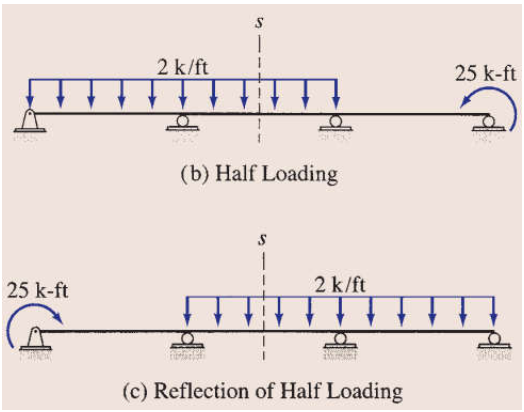


بارگذاری کلی = بارگذاری متقارن + بارگذاری پادمتقارن

مثال ①

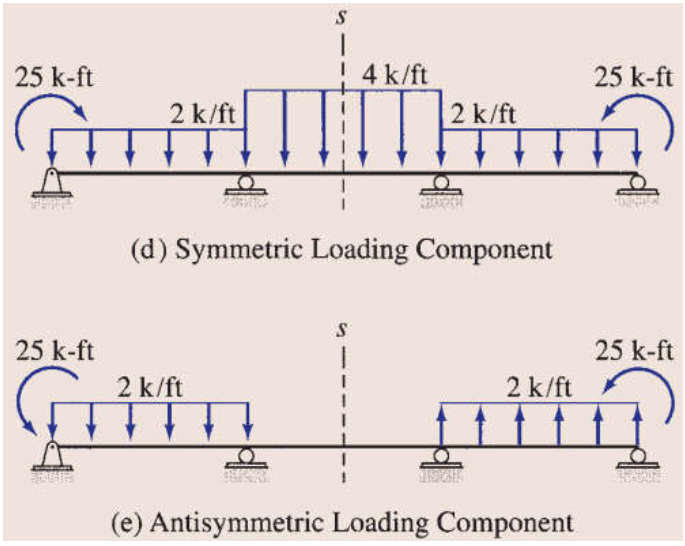


(a) Given Loading



(b) Half Loading

(c) Reflection of Half Loading



(d) Symmetric Loading Component

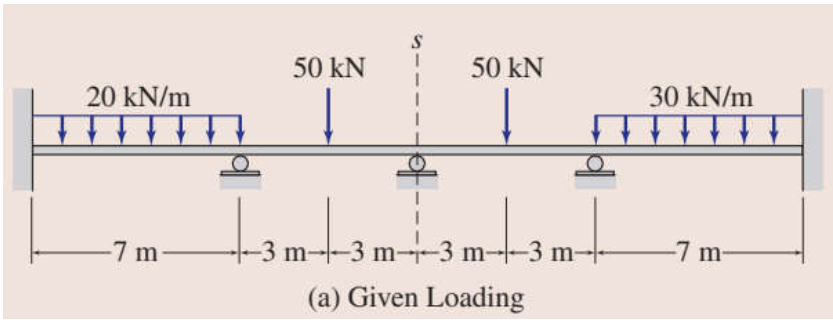
(e) Antisymmetric Loading Component

① رسم سازه با نصف بار و تصویر آینه‌ای آن نسبت به محور تقارن

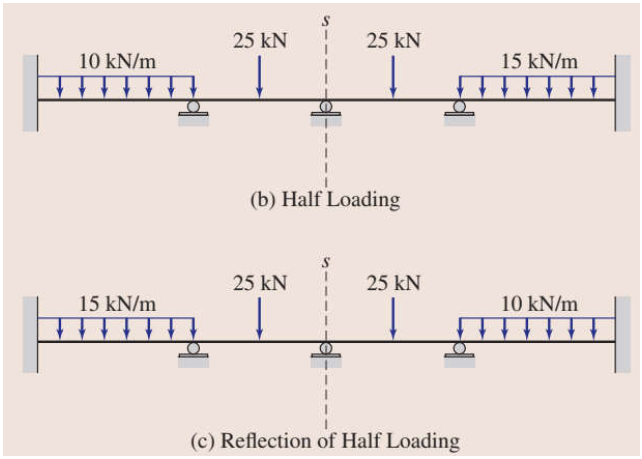
② جمع بارها ①+② تقارن

② تفریق بارها ①-② پادمتقارن

مثال ②

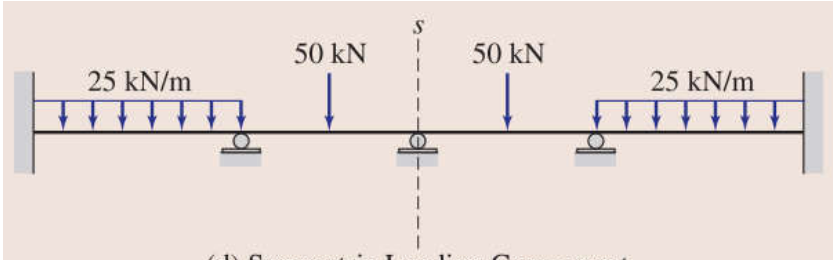


(a) Given Loading

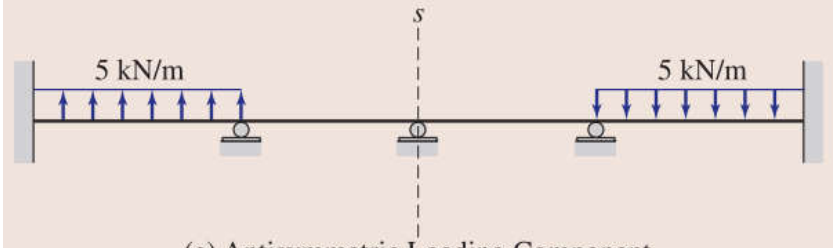


(b) Half Loading

(c) Reflection of Half Loading



(d) Symmetric Loading Component



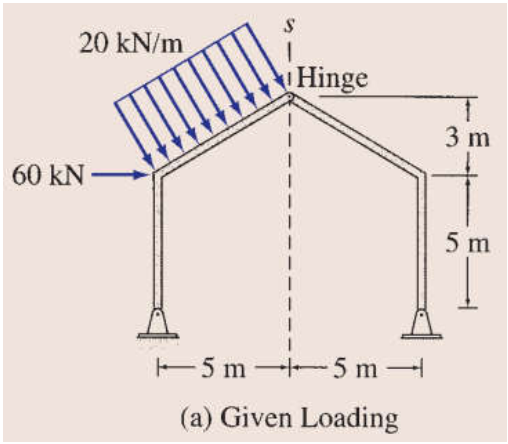
(e) Antisymmetric Loading Component

20 10

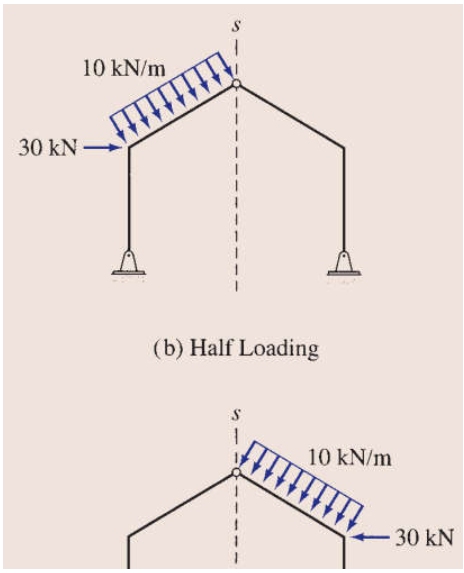
15 15

5 -5

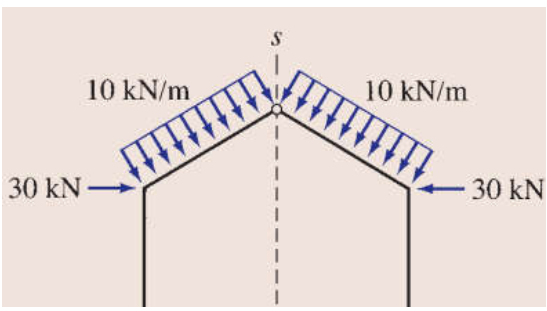
مثال ۳

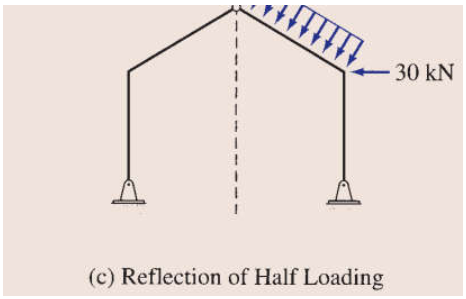


(a) Given Loading

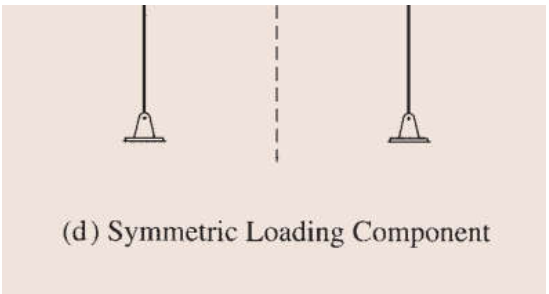


(b) Half Loading

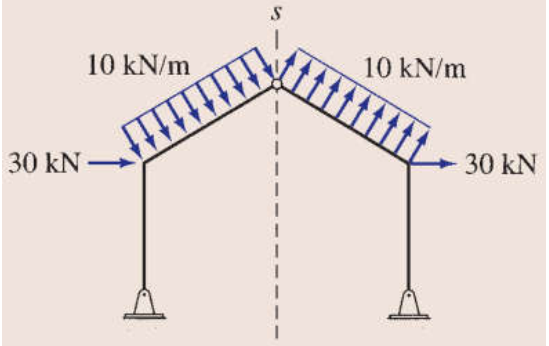




(c) Reflection of Half Loading

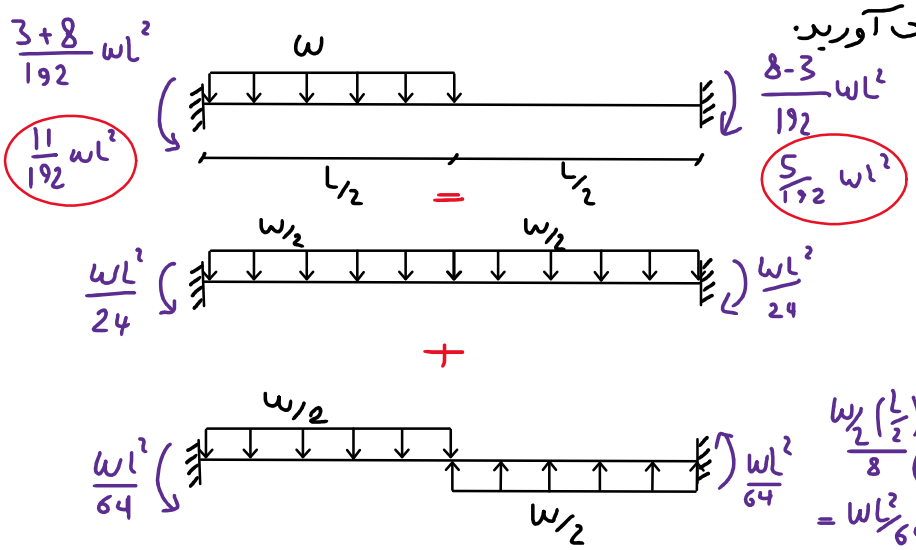


(d) Symmetric Loading Component



(e) Antisymmetric Loading Component

مثال: لنگرهای گیرداری دوسرتیر را به دست آورید.



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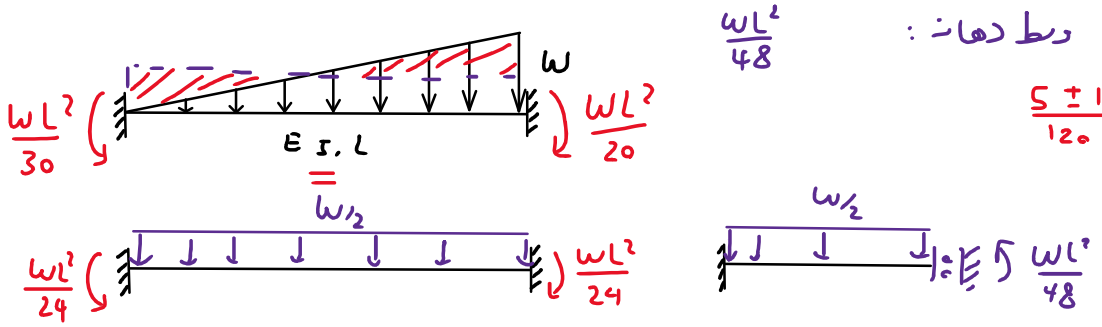


$$\delta_y = \frac{\partial U}{\partial R} = 0 \rightarrow U = \int \frac{1}{2}\frac{M^2}{EI}dx \rightarrow \frac{1}{EI}\int M\left(\frac{\partial M}{\partial R}\right)dx = 0$$

$$\int_0^{L/2}\left(Rx + \frac{w}{L}\frac{x^3}{6}\right)(x)\,dx = 0$$

$$\int_0^{L/2}\left(Rx^2 + \frac{w}{L}\frac{x^4}{6}\right)dx = 0$$

$$\left(R\frac{x^3}{3} + \frac{w}{L}\frac{x^5}{30}\right)\Big|_0^{L/2} = 0$$

$$R\left(\frac{L^3}{24}\right) = \frac{-w}{L}\frac{L^5}{30\times 32}$$

$$R = -\frac{wL^2}{40}$$

$R = \frac{wL^2}{40}$ ↑

$M = Rx + \frac{1}{2}\left(\frac{w}{L}x\right)x\left(\frac{x}{3}\right)$

$M = Rx + \frac{w}{L}\frac{x^3}{6}$

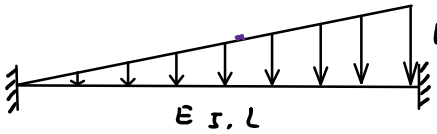
$\frac{\partial M}{\partial R} = x$

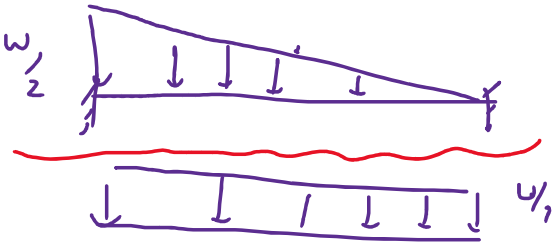
$-\frac{wL^2}{40}\left(\frac{L}{2}\right) +$

$\frac{1}{2}\left(\frac{w}{2}\right)\left(\frac{L}{2}\right)\left(\frac{L}{6}\right) =$

$\left(\frac{1}{80} + \frac{1}{48}\right)$

$\frac{-3+5}{5\times 16\times 3}$





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