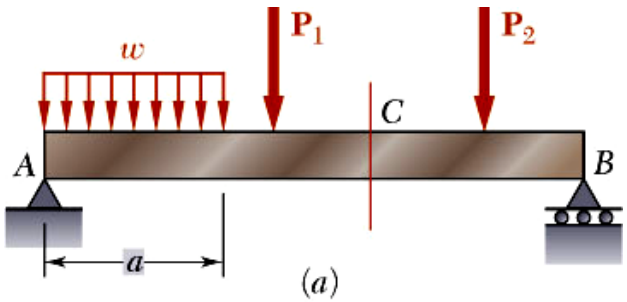
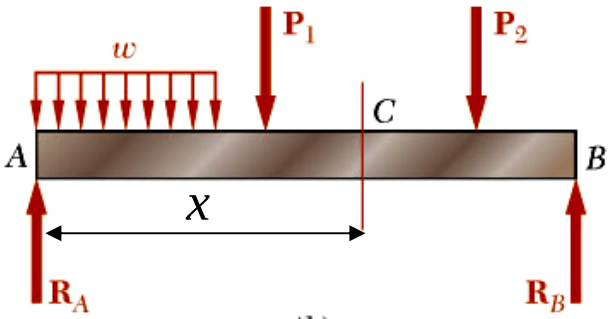
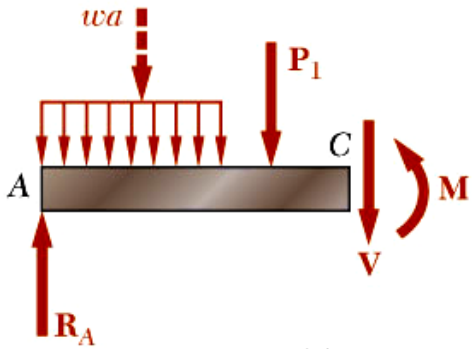
Kirişlerde Kesme Kuvveti ve Eğilme Momenti Diyagramları



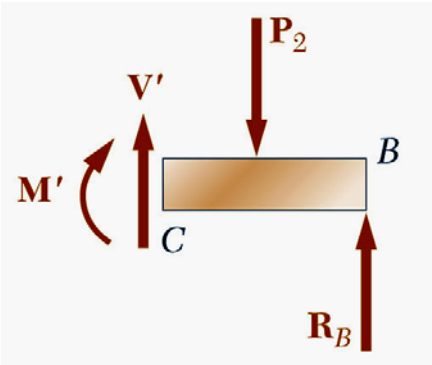
(a)



(b)



(c)



- Amaç – kirişlerin analiz ve dizaynı
- Kirişler düşey olarak genellikle *tekil* ve/veya *yayılı* yüklere maruz kalırlar
- Uygulanan kuvvetler kirişin kesitlerinde **iç** kesme kuvvetleri ve momentleri meydana getirirler. Kesit üzerinde kesme iç kuvvetinden den dolayı kayma gerilmeleri momentten dolayı da normal gerilmeler meydana gelir.
- Bir tasarımda normal gerilmelere neden olan maksimum momentin yeri ve değerini bilmek önemlidir. Çünkü, normal gerilmeler daha büyük ve daha kritiktir.

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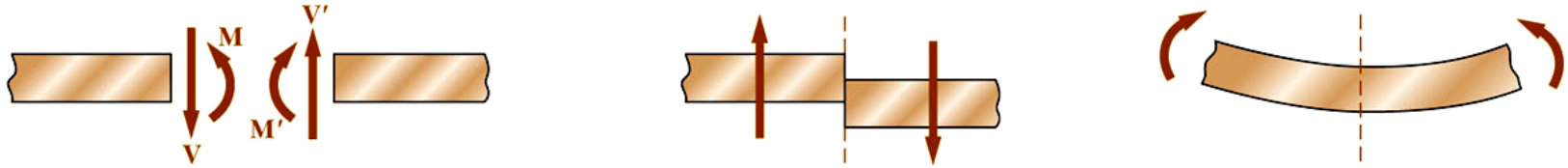
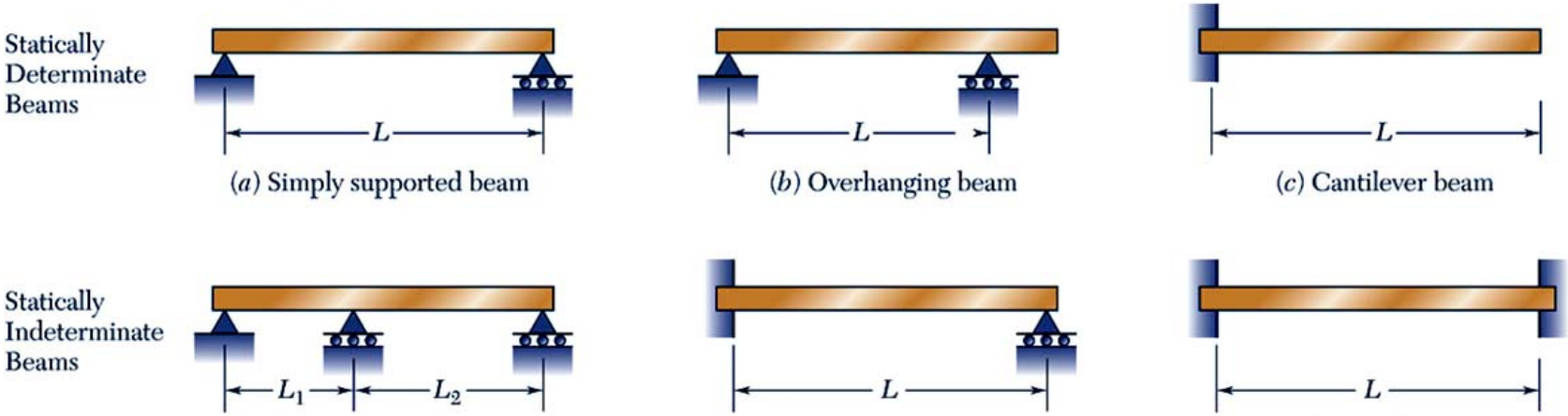


(*a*) Internal forces (positive shear and positive bending moment)

(*b*) Effect of external forces (positive shear)

(*c*) Effect of external forces (positive bending moment)

Kirişlerde genel mesnet tipleri



(*a*) Simply supported beam

(*b*) Overhanging beam

(*c*) Cantilever beam

(*d*) Continuous beam

(*e*) Beam fixed at one end and simply supported at the other end

(*f*) Fixed beam

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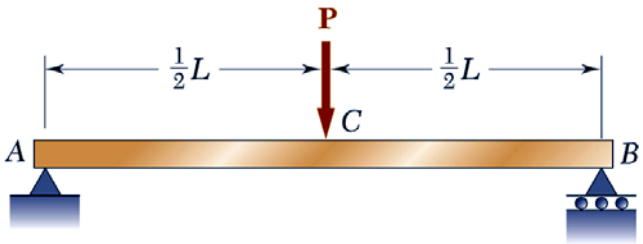
Örnek



Şekildeki kirişin kesme kuvveti ve eğilme momenti diyagramlarını çiziniz.

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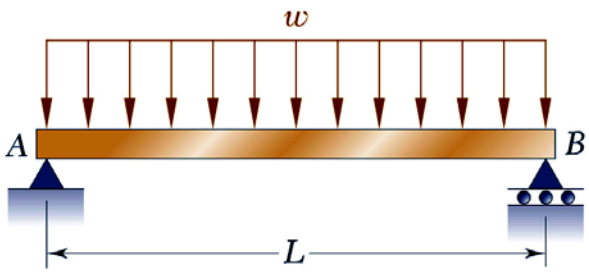
Örnek



Şekildeki kirişin kesme kuvveti ve eğilme momenti diyagramlarını çiziniz.

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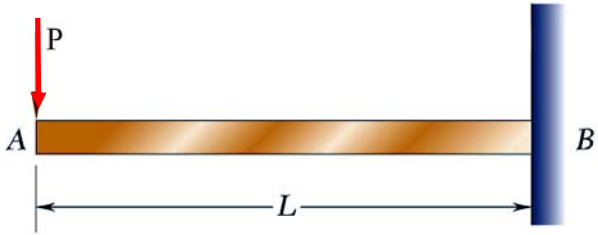
Örnek



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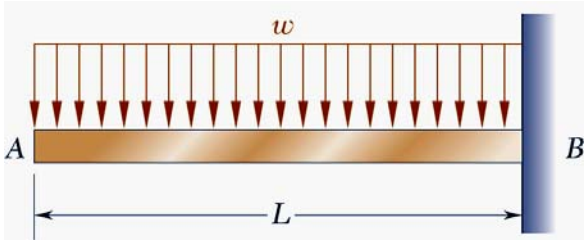
Örnek



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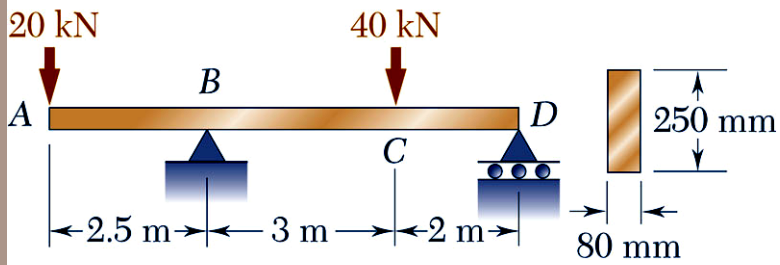
Örnek



Şekildeki kirişin kesme kuvveti ve eğilme momenti diyagramlarını çiziniz.

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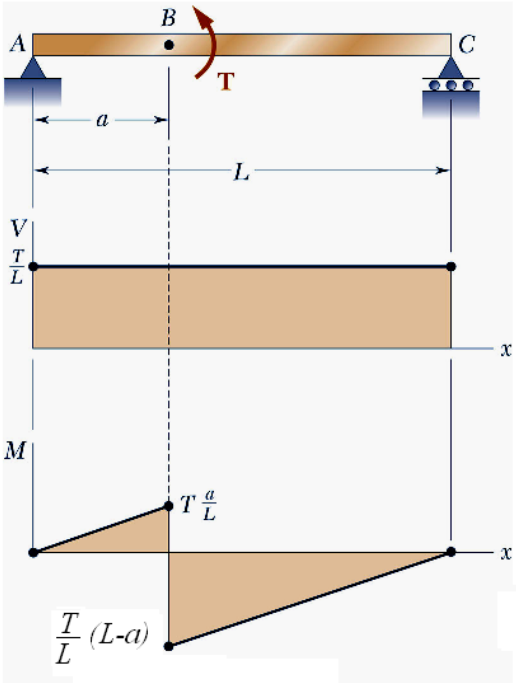
Örnek



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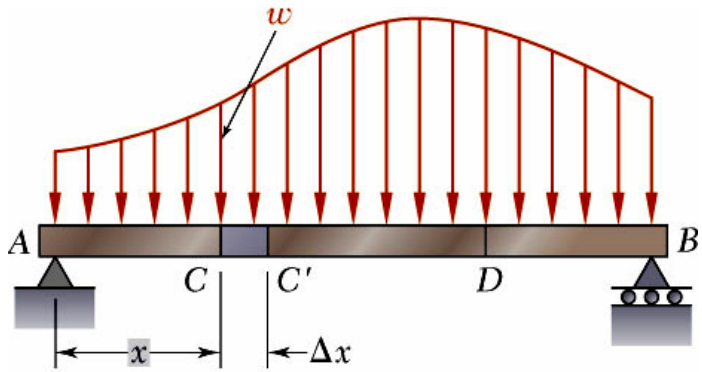
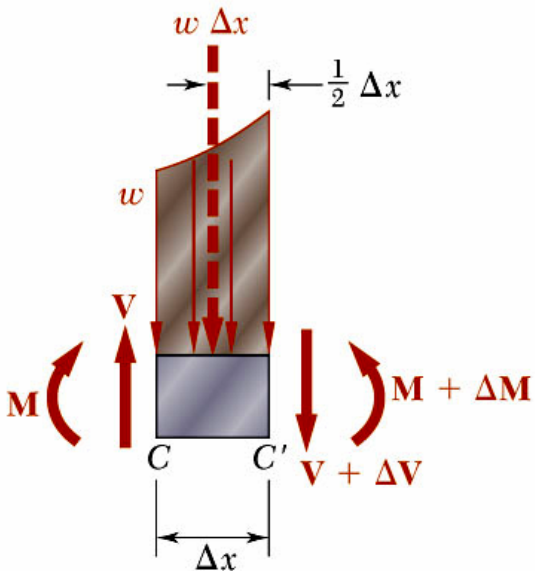
Yük, kesme kuvveti ve moment arasındaki ilişki





- **Yayılı yük ile kesme kuvveti arasındaki ilişki:**

$$\sum F_y = 0: \quad V - (V + \Delta V) - w\Delta x = 0$$

$$\Delta V = -w\Delta x$$

$$\frac{dV}{dx} = -w \longrightarrow V_D - V_C = -\int_{x_C}^{x_D} w\, dx$$

$V_D - V_C =$ - (CD arasında yayılı yük eğrisi altında kalan alan)

- **Kesme kuvveti ile eğilme momenti arasındaki ilişki:**

$$\sum M_{C'} = 0: \quad (M + \Delta M) - M - V\Delta x + w\Delta x\frac{\Delta x}{2} = 0$$

$$\Delta M = V\Delta x - \tfrac{1}{2}w(\Delta x)^2$$

$$\frac{dM}{dx} = V \longrightarrow M_D - M_C = \int_{x_C}^{x_D} V\, dx$$

$M_D - M_C =$ (CD arasında kesme kuvveti eğrisi altında kalan alan)

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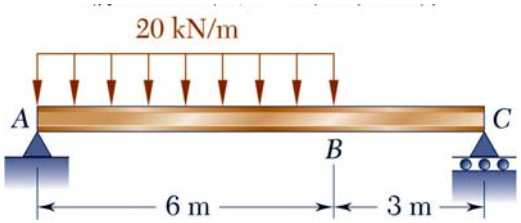
Örnek



Şekildeki kirişin kesme kuvveti ve eğilme momenti diyagramlarını çiziniz.

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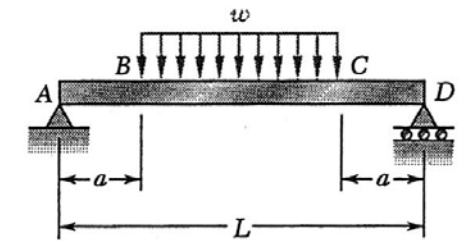
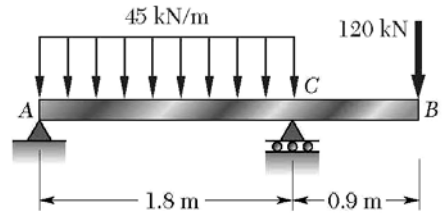
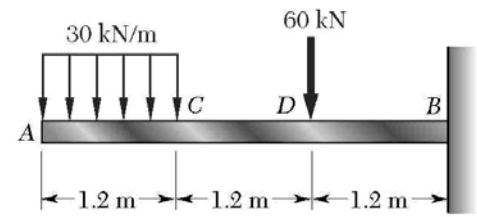
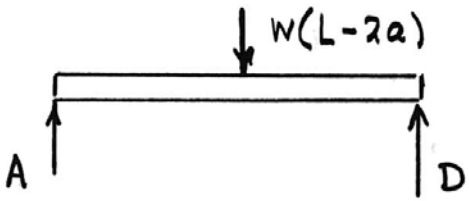
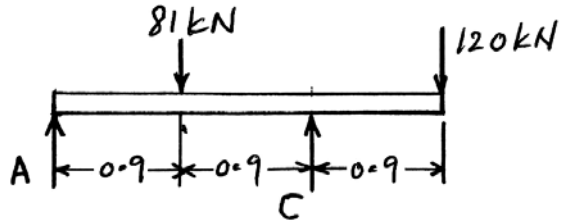
Uygulama Problemleri

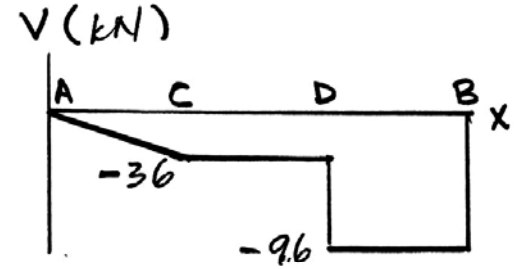


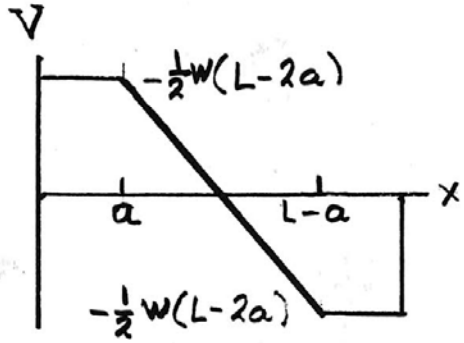


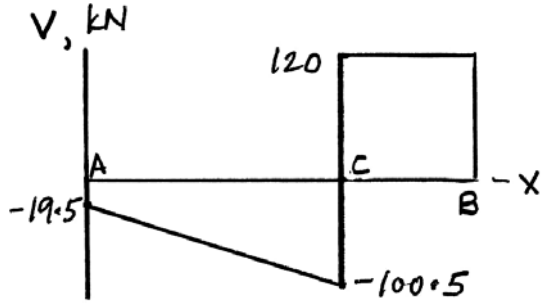


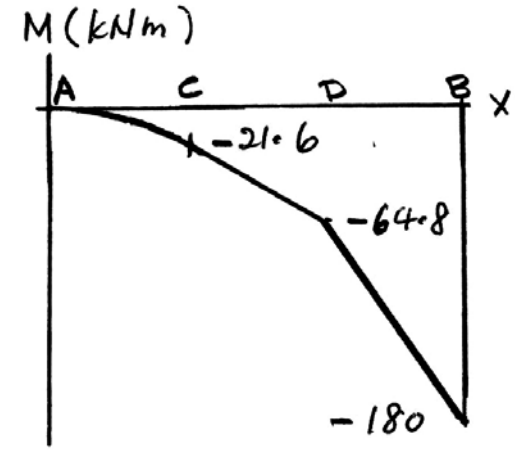


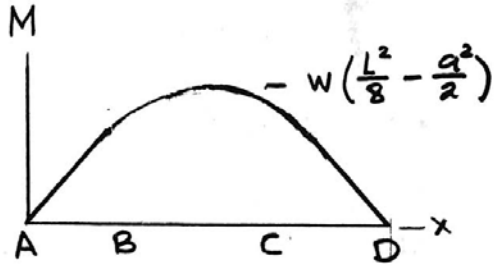


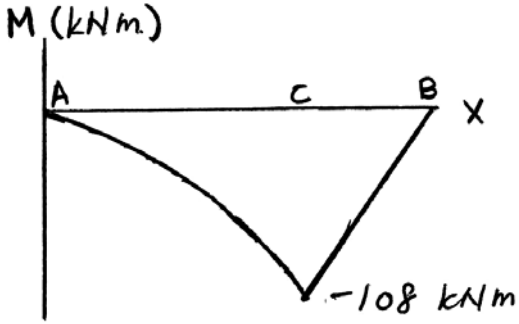












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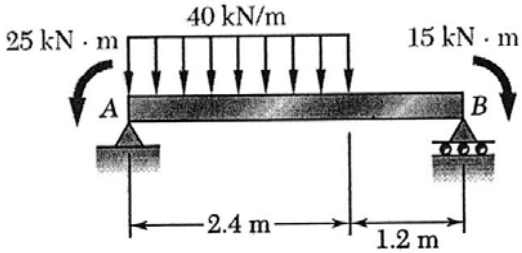

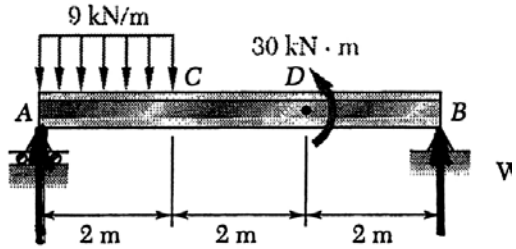

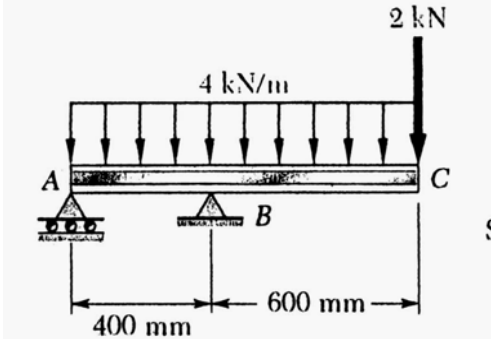

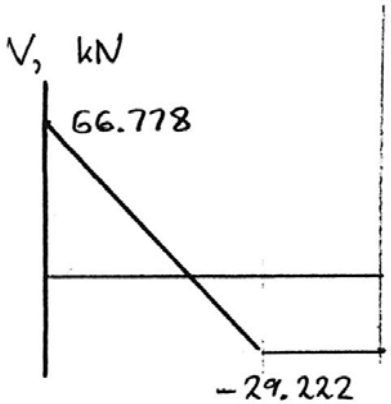

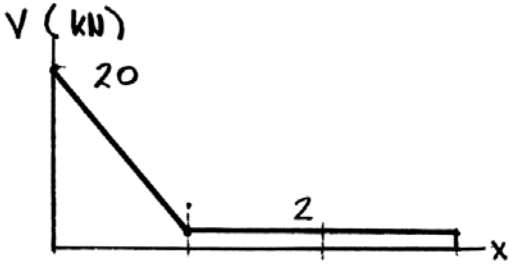

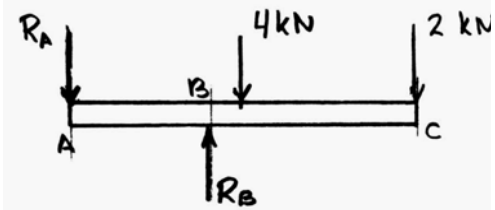

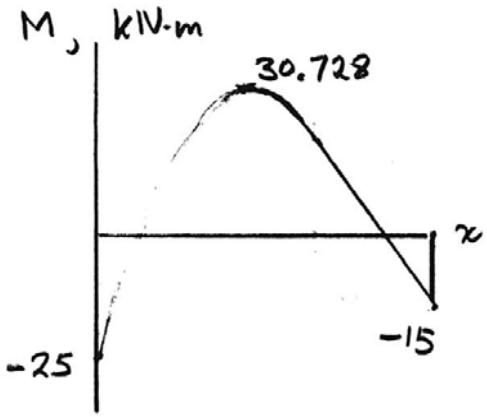

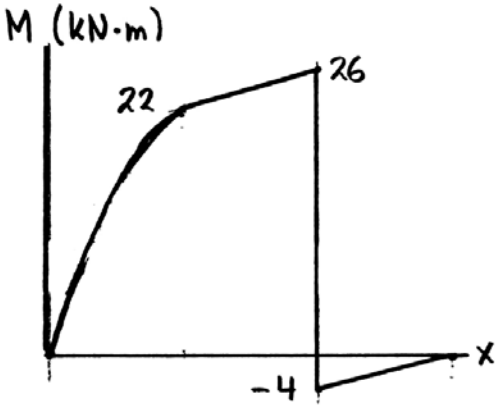

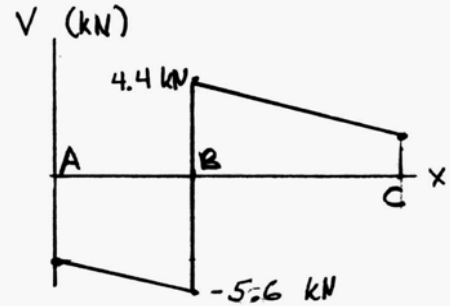

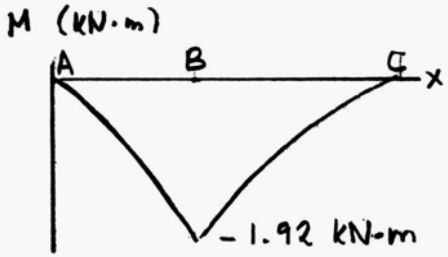

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