

## Exercício 1

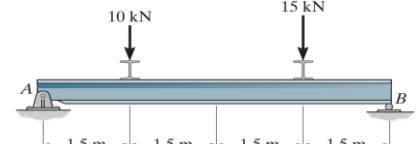


Diagrama de Corpo Livre:



$$\text{Equação dos carregamentos externos (forças em } y\text{, carregamentos distribuídos por } x\text{ paralelos a } y\text{, momentos em } z\text{):}$$

$$q(x) = +Fya(x-0)^{-1} - 10000(x-1,5)^{-1} - 15000(x-4,5)^{-1} + Fyb(x-6)^{-1}$$

$$\text{Equação da Força Corrente:}$$

$$V(x) = \int q(x) dx$$

$$V(x) = \int (Fya(x-0)^{-1} - 10000(x-1,5)^{-1} - 15000(x-4,5)^{-1} + Fyb(x-6)^{-1}) dx$$

$$V(x) = Fya(x-0)^0 - 10000(x-1,5)^0 - 15000(x-4,5)^0 + Fyb(x-6)^0 + C1$$

$$M(x) = Fya(x-0)^1 - 10000(x-1,5)^1 - 15000(x-4,5)^1 + Fyb(x-6)^1 + C1 \cdot x + C2$$

$$\text{Análise das Constantes de Integração:}$$

$$x = 0^+ \quad \begin{cases} V(0^+) = 0N \\ M(0^+) = 0Nm \end{cases}$$

$$V(0^-) = Fya(0^- - 0)^0 - 10000(0^- - 1,5)^0 - 15000(0^- - 4,5)^0 + Fyb(0^- - 6)^0 + C1 = 0$$

$$Fya \cdot 0 - 10000 \cdot 0 - 15000 \cdot 0 + Fyb \cdot 0 + C1 = 0$$

$$C1 = 0N$$

$$M(0^-) = Fya(0^- - 0)^1 - 10000(0^- - 1,5)^1 - 15000(0^- - 4,5)^1 + Fyb(0^- - 6)^1 + C1 \cdot 0^+ + C2 = 0$$

$$Fya \cdot 0 - 10000 \cdot 0 - 15000 \cdot 0 + Fyb \cdot 0 + C1 \cdot 0 + C2 = 0$$

$$C2 = 0Nm$$

Reescrever Equações de Força Corrente e Momento Interno:

$$V(x) = Fya(x-0)^0 - 15000(x-1,5)^0 - 15000(x-4,5)^0 + Fyb(x-6)^0$$

$$M(x) = Fya(x-0)^0 - 10000(x-1,5)^1 - 15000(x-4,5)^1 + Fyb(x-6)^1$$

$$M(x) = Fya(0^+ - 0)^0 - 10000(0^+ - 1,5)^1 - 15000(0^+ - 4,5)^1 + Fyb(0^+ - 6)^1$$

$$\text{Reações de Apoio:}$$

$$x = L^+ = 6^+ \quad \begin{cases} V(6^+) = 0N \\ M(6^+) = 0Nm \end{cases}$$

$$V(6^+) = Fya(6^+ - 0)^0 - 10000(6^+ - 1,5)^0 - 15000(6^+ - 4,5)^0 + Fyb(6^+ - 6)^0 = 0$$

$$Fya \cdot 1 - 10000 \cdot 1 - 15000 \cdot 1 + Fyb \cdot 1 = 25000 \quad \text{Equação 1}$$

$$M(6^+) = Fya(6^+ - 0)^1 - 10000(6^+ - 1,5)^1 - 15000(6^+ - 4,5)^1 + Fyb(6^+ - 6)^1 = 0$$

$$Fya \cdot (6 - 0)^1 - 10000 \cdot (6 - 1,5)^1 - 15000 \cdot (6 - 4,5)^1 + Fyb \cdot (6 - 6)^1 = 0$$

$$Fya = 11250N$$

Substituir Fya na Equação 1:

$$11250 + Fyb = 25000$$

$$Fyb = 13750N$$

Reescrever Equações de Forças Corantes e Momentos:

$$V(x) = 11250(x-0)^0 - 10000(x-1,5)^0 - 15000(x-4,5)^0 + 13750(x-6)^0$$

$$M(x) = 11250(x-0)^0 - 10000(x-1,5)^1 - 15000(x-4,5)^1 + 13750(x-6)^1$$

$$T_a = 0Nm$$

$$\text{Tabela de Valores:}$$

| x[m]         | V(x)[N] | M(x)[Nm] |
|--------------|---------|----------|
| 0 direita    | 11250   | 0        |
| 1,5 esquerda | 11250   | 16875    |
| 1,5 direita  | 11250   | 16875    |
| 4,5 esquerda | 11250   | 20625    |
| 4,5 direita  | -13750  | 20625    |
| 6 esquerda   | -13750  | 0        |

Diagrama de Corpo Livre:

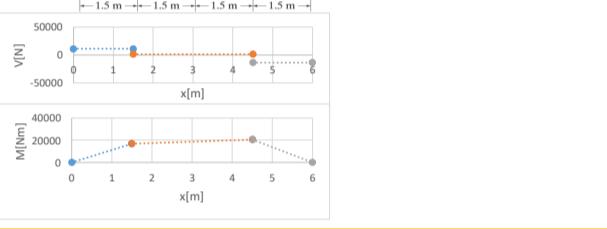
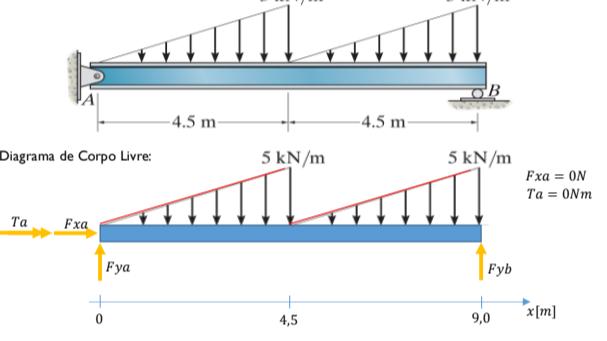


Diagrama de Corpo Livre:



$$\text{Equação dos carregamentos distribuídos:}$$

$$w = -(\alpha(x-0)^1 - 5000(x-0)^0 - 5000(x-4,5)^0)$$

$$w = -\left(\frac{5000}{4,5}(x-0)^1 - 5000(x-4,5)^0\right)$$

$$\alpha = \frac{5000}{4,5} = \frac{5000}{4,5} [N/m]$$

$$w = -\left(\frac{5000}{4,5}(x-0)^1 - 5000(x-4,5)^0\right)$$

$$V(x) = Fya(x-0)^{-1} - \left(\frac{5000}{4,5}(x-0)^1 - 5000(x-4,5)^0\right) + Fyb(x-9)^{-1}$$

$$q(x) = Fya(x-0)^{-1} - \frac{5000}{4,5}(x-0)^1 + 5000(x-4,5)^0 + Fyb(x-9)^{-1}$$

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