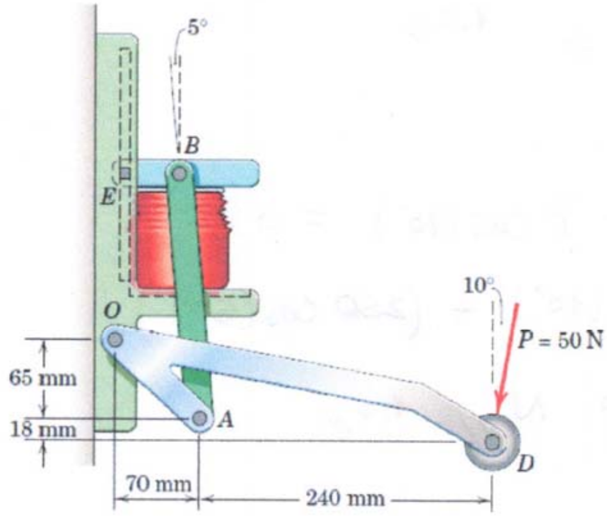
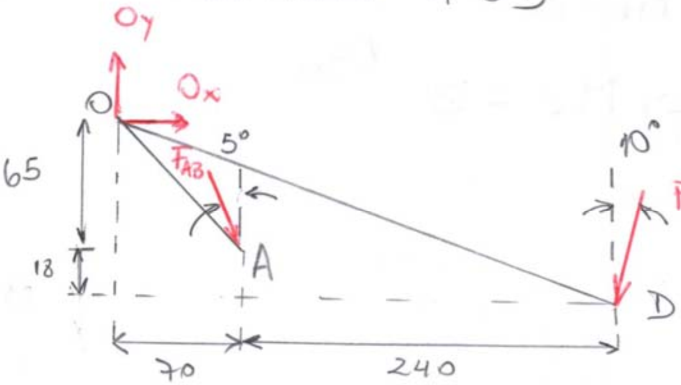
Pregunta #1

total 10 ptos.



D. C. L. Elemento A O D



1.0 //

$$\sum_{O} M_z = 0$$

$$-70 \cdot F_{AB} \cos(5°) + 65 F_{AB} \sin(5°) - 310 \cdot 50 \cdot \cos(10°) - 83 \cdot 50 \cdot \sin(10°) = 0$$

$$F_{AB} \left(65 \sin(5°) - 70 \cos(5°)\right) = 50 \left(310 \cos(10°) + 83 \cdot \sin(10°)\right)$$

$$F_{AB} \approx -250 \text{ N}$$

// 2.0 //

$\Rightarrow O_x + F_{AB}\sin(5°) - P\sin(10°) = \varnothing$

$O_x = 50\sin(10°) + (250\sin(5°))$

$O_x = 30{,}47$ [N] // 1.0//

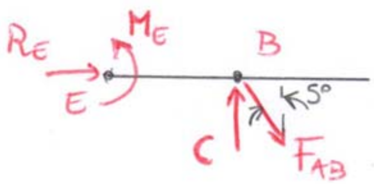
$\sum F_y = 0$

$\Rightarrow O_y - F_{AB}\cos(5°) - P\cos(10°) = \varnothing$

$O_y = 50\cos(10°) + (250\cos(5°))$

$O_y = -200$ N // 1.0//

D.C.L elemento EB



1,0//

$\sum_B M_t = 0$ 1.0//

$\Rightarrow M_E = \varnothing$

$\sum F_x = 0$

$R_E + F_{AB}\sin(5°) = \varnothing$

$R_E = 250\sin(5°)$

$R_E = -21{,}78$ N // 1.0//

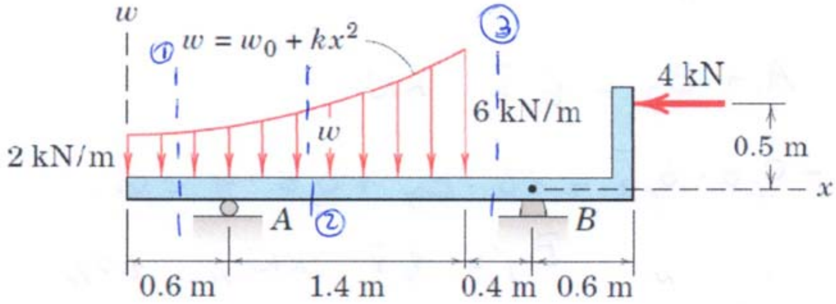
$\sum F_y = 0$

$C = F_{AB}\cos(5°)$

$C = -249{,}04$ N // * fuerza de compresión sobre la lata 2.0//

Pauta Pregunta #2

total 28 ptos.



$W = w_0 + k x^2$

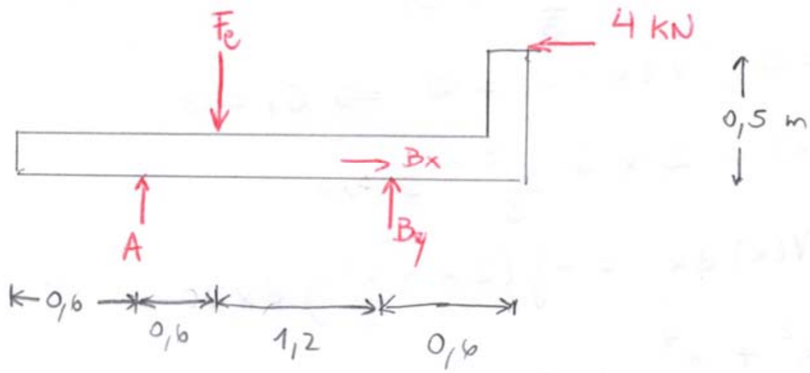
$W(x=0) = w_0 = 2\,kN/m$ 0.5 //

$W(x=2) = 2\,kN/m + k \cdot 4 = 6\,kN/m$

$\Rightarrow k = 1$ 0.5 //

$\therefore W(x) = 2 + x^2 \; [kN]$ //

D.C.L sistema



1.0 //

$\sum F_x = 0$

$\Rightarrow B_x = 4\ kN$

$$F_e = \int_0^2 (2 + x^2)\,dx = 2x\Big|_0^2 + \frac{x^3}{3}\Big|_0^2 = 4 + 8/3$$

$F_e = 6,\bar{6}\ kN$ // 1.0 //

$$\bar{x} = \frac{\int_0^2 x\,w(x)\,dx}{F_e} = \frac{\int_0^2 (2x + x^3)\,dx}{6,\bar{6}} = \frac{1}{6,\bar{6}}\left(x^2\Big|_0^2 + \frac{x^4}{4}\Big|_0^2 \right)$$

$$\bar{x} = 1,2 \text{ m} \;//\quad 1.0//$$

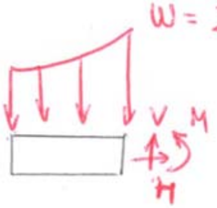
$$\sum F_y = 0 \Rightarrow A + B_y = 6,\bar{6} \text{ kN}$$

$$\sum_A M_z = 0 \Rightarrow -0,6 \cdot 6,\bar{6} + 1,8 \cdot B_y + 0,5 \cdot 4 = 0$$

$$B_y = 1,\bar{1} \text{ kN} \;//\quad 1.0//$$

$$\therefore \quad A = 5,\bar{5} \text{ kN} \;//\quad 1.0//$$

D.C.L. corte (1) $\quad x \in [0,\ 0.6)$



1.0//

$$\sum F_x = 0$$

$$\Rightarrow H(x) = 0 \;//\quad 1.0//$$

$$V = \int w(x)\,dx = \int 2 + x^2\,dx$$

$$V = 2x + \frac{x^3}{3} + C_1$$

en $x = 0$, $V(x=0) = 0 \Rightarrow C_1 = 0$

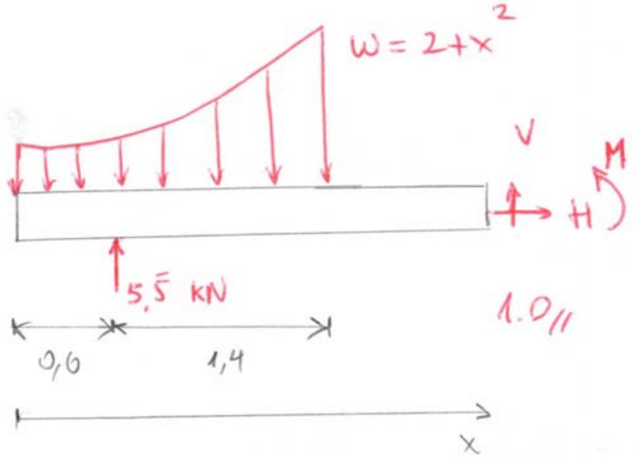
$$\Rightarrow V(x) = 2x + \frac{x^3}{3} \quad 2.0//$$

$$M(x) = -\int V(x)\,dx = -\int \left(2x + \frac{x^3}{3}\right) dx$$

$$M(x) = -\left(x^2 + \frac{x^4}{12} + C_2\right)$$

en $x = 0$, $M(x=0) = 0 \Rightarrow C_2 = 0$

$$\therefore M(x) = -x^2 - \frac{x^4}{12} \;// \quad 2.0//$$



1.0//

$$\sum F_x = 0$$

$$\Rightarrow H(x) = 0$$ 1.0//

$$\sum F_y = 0$$

$$\Rightarrow V(x) = \int_0^2 (2+x^2)\,dx - 5,\bar{5}\ \text{kN}$$

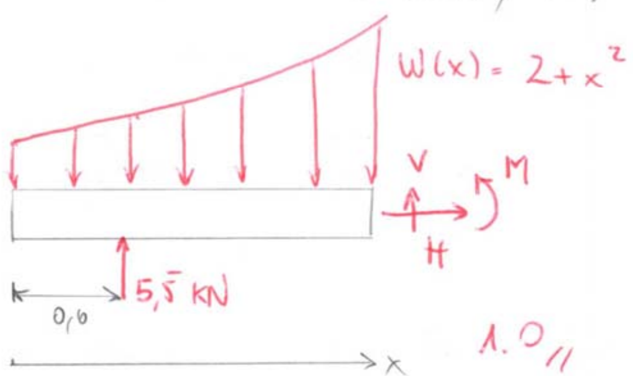
$$V(x) = 1,\bar{1}\ \text{kN}$$ // 2.0//

$$\sum_x M_z = 0$$

$$-5,\bar{5}(x-0,6) + 6,\bar{6}(x-1,2) + M(x) = 0$$

$$\Rightarrow M(x) = -1,\bar{1}x + 4,\bar{6}\ \text{kNm}$$ 2.0//

Corte ② $x \in [0.6, 2]$



1.0//

$$\sum F_x = 0$$

$$\Rightarrow H(x) = 0$$ 1.0//

$$V(x) = \int w(x)\,dx = \int (2+x^2)\,dx$$

$$V(x) = 2x + \frac{x^3}{3} + C_3$$

Pero $V(x=2) = 1,\bar{1}$ kN

$$\Rightarrow C_3 = -5,\bar{5}\ \text{kN}$$

$$\therefore V(x) = 2x + \frac{x^3}{3} - 5,\bar{5}\ \text{kN}$$ // 2.0//

$$M(x) = -x^2 - \frac{x^4}{12} + 5,\bar{5}\,x + C_4$$

En $x = 2$ $\quad M(2) = -1,\bar{1}\cdot 2 + 4,\bar{6} = 2,\bar{4}$ kN·m

$$\therefore\ C_4 = 2,\bar{4} + 4 + \frac{2^4}{12} - 5,\bar{5}\cdot 2$$

$$C_4 = -3,\bar{3}\ \text{kN·m}$$

$$\therefore\ M(x) = -x^2 - \frac{x^4}{12} + 5,\bar{5}\,x - 3,\bar{3}$$ 20%

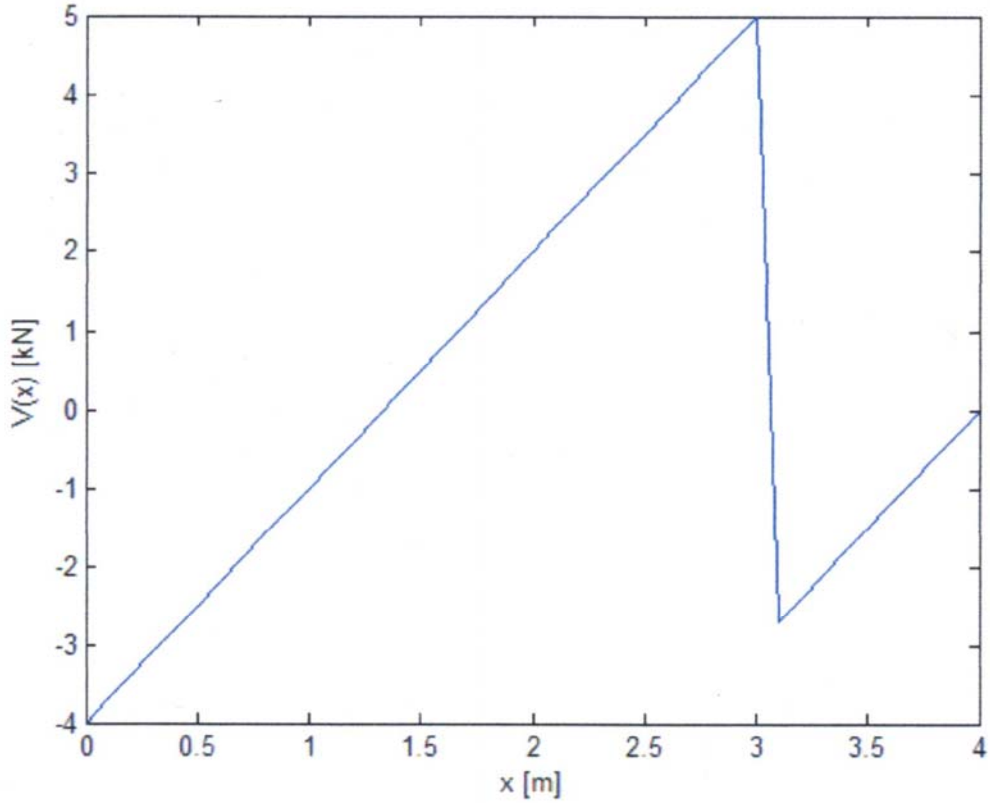
$\therefore$ Entre los puntos A y B $x \in [0,6\ ,\ 2.4]$

Se tiene

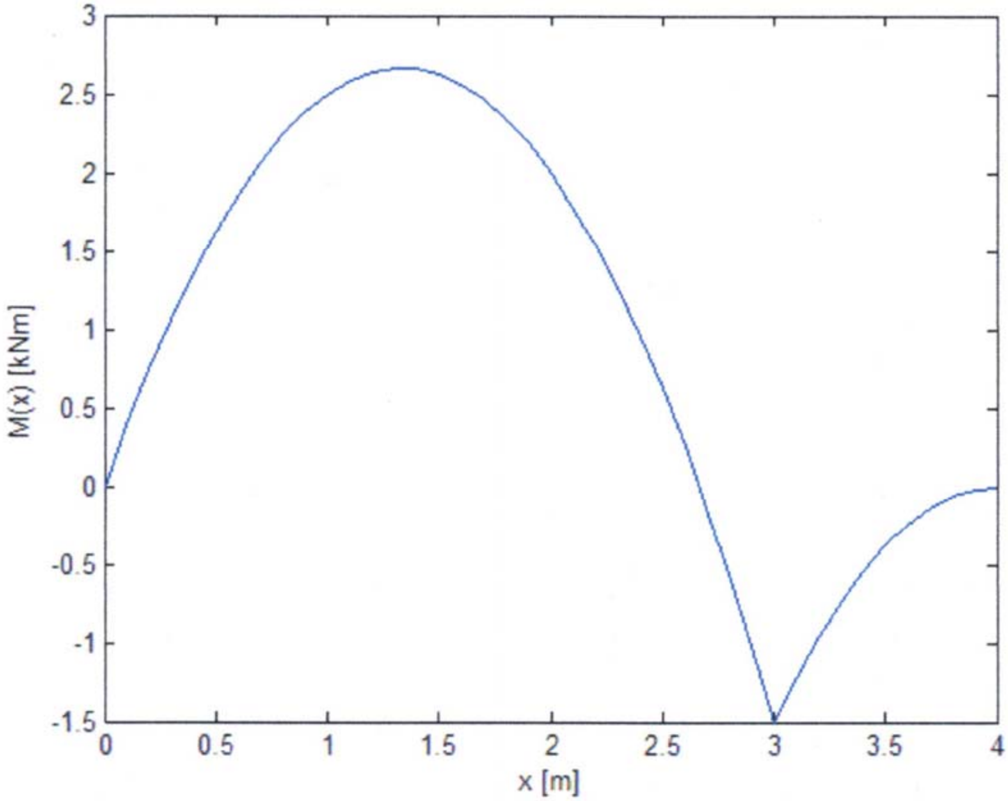
$$H(x) = 0$$

$$V(x) = \begin{cases} 2x + \frac{x^3}{3} - 5,\bar{5}\ \text{kN} & \text{si } x \in [0.6\ ,\ 2) \\ 1,\bar{1}\ \text{kN} & \text{si } x \in [2\ ,\ 2,4] \end{cases}$$

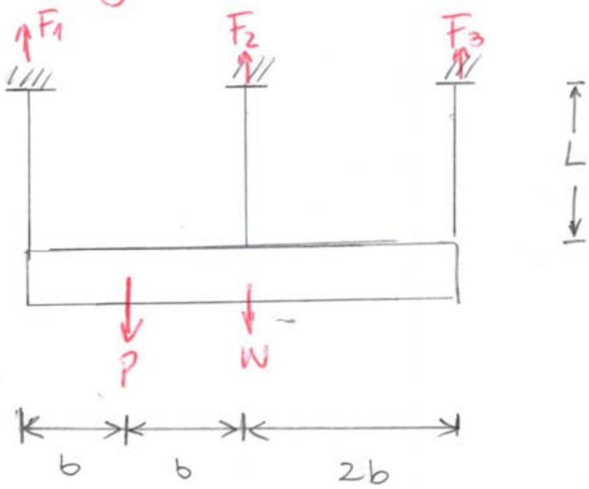
$$M(x) = \begin{cases} -\frac{x^4}{12} - x^2 + 5,\bar{5}\,x - 3,\bar{3}\ \text{kNm} & \text{si } x \in [0,6\ ,\ 2) \\ -1,\bar{1}\,x + 4,\bar{6}\ \text{kNm} & \text{si } x \in [2\ ,\ 2,4] \end{cases}$$



V(x) [kN]
x [m]
5
4
3
2
1
0
-1
-2
-3
-4
0
0.5
1
1.5
2
2.5
3
3.5
4



M(x) [kNm]
x [m]
3
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
0
0.5
1
1.5
2
2.5
3
3.5
4



$E = 190$ GPa

$W = 10$ kN

$P = 5$ kN

$d = 0{,}5$ cm

$L = 1$ m

$b = 50$ cm

$\sum F_y = 0$

$$\Rightarrow F_1 + F_2 + F_3 = 15 \text{ N} \qquad (1)$$

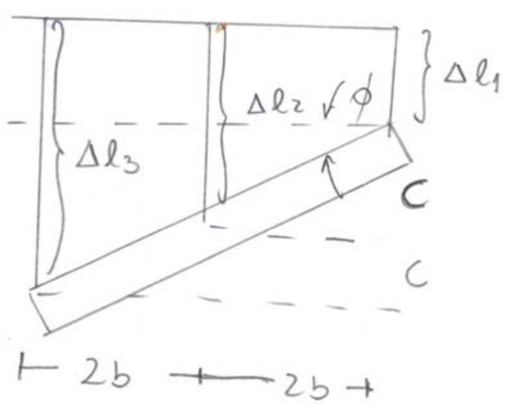
$\sum\limits_z M_z = 0$

$$bP - 2bF_1 + 2bF_3 = 0$$

$$5 \text{ kN} - 2F_1 + 2F_3 = 0 \qquad (2)$$

1.5 //

El problema es hiperestático, la ecuación faltante se obtiene a partir de un análisis geométrico de las deformaciones cuando el cuerpo se encuentra deformado



$$(\Delta l_3 - \Delta l_1)/4b = (\Delta l_2 - \Delta l_1)/2b$$

$$\Delta l_3 - \Delta l_1 = 2(\Delta l_2 - \Delta l_1)$$

pero: $\dfrac{\Delta l_i}{L} = \dfrac{F_i}{EA} \Rightarrow \dfrac{L}{EA}(F_3 - F_1) = \dfrac{2L}{EA}(F_2 - F_1)$

1.5 //

$$\therefore F_3 = 2F_2 - F_1 \quad (3)$$

2

$$F_1 + F_2 + F_3 = 15 \text{ kN} \quad (1)$$

$$-2F_1 + 2F_3 = -5 \text{ kN} \quad (2)$$

2.0 //

$$F_1 - 2F_2 + F_3 = \varnothing \quad (3)$$

$(1) - (3)$

$$\Rightarrow 3F_2 = 15 \text{ kN}$$

$$F_2 = 5 \text{ kN} \,//$$

$2(1) + (2)$

$$\Rightarrow 4F_3 = 15 \text{ kN}$$

$$F_3 = \frac{15}{4} \text{ kN}$$

$$F_3 = 3{,}75 \text{ kN} \,//$$

$$\therefore F_1 = 6{,}25 \text{ kN} \,//$$

$$\Rightarrow \sigma_1 = \frac{F_1}{\frac{\pi d^2}{4}} = 3{,}183 \text{ MPa} \,//$$

$$\sigma_2 = 2{,}546 \text{ MPa} \,//$$

1.0 //

$$\sigma_3 = 1{,}909 \text{ MPa} \,//$$