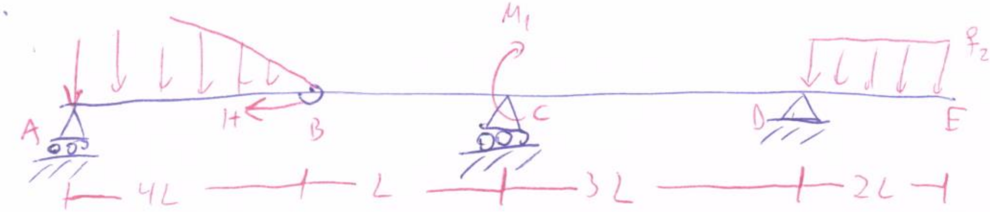
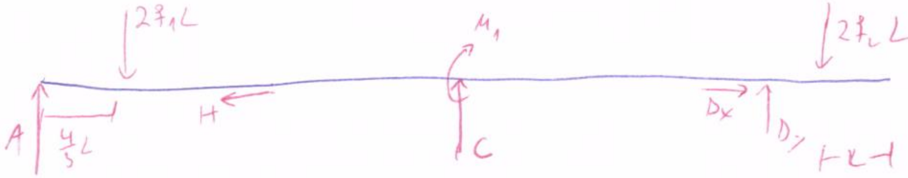


* DCL Completo



$\to \sum F_x = 0 \Rightarrow \boxed{H = D_x = 100\ kN}$

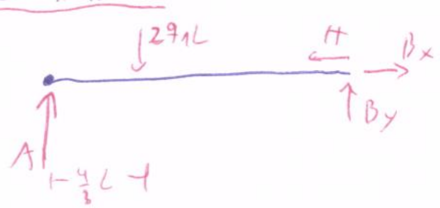
$\to \sum F_y = 0 \Rightarrow A - 2q_1L + C + D_y - 2q_2L = 0$

$\boxed{A + C + D_y = 2L(q_1 + q_2)}$ (i)

$\to \sum_D M_z = 0 \Rightarrow -8LA + (8L - \frac{4}{3}L)2q_1L - M_1 - 3LC - 2q_2L^2 = 0$

$\boxed{8LA + 3LC = -M_1 + 2q_2L^2 + \frac{40}{3}q_1L^2}$ (ii)

* DCL AB



$\cdot \sum_B M_z = 0 \Rightarrow -4LA + (4L - \frac{4}{3}L)2q_1L = 0$

$\boxed{\therefore A = \frac{4}{3}q_1L = 100\ kN}$

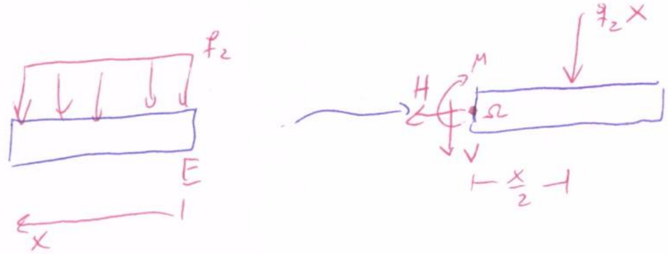
$\cdot \sum F_y = 0 \to \boxed{B_y = 2q_1L - A = 50\ kN}$

$\Rightarrow$ En (ii) $\rightsquigarrow$ $\boxed{C = -\frac{M_1}{3L} + \frac{2}{3}q_2L + \frac{40}{9}q_1L - \frac{8}{3}A = 13,33\ kN}$

$\Rightarrow$ En (i) $\rightsquigarrow$ $\boxed{D_y = 2L(q_1 + q_2) - A - C = 136,67\ kN}$

* **Cargas internas**: Los diagramas de cargas internas son equivalentes si los cortes se realizan desde la izquierda o derecha. Es más simple en este caso comenzar por la derecha

(i) $0 < x < 2L$



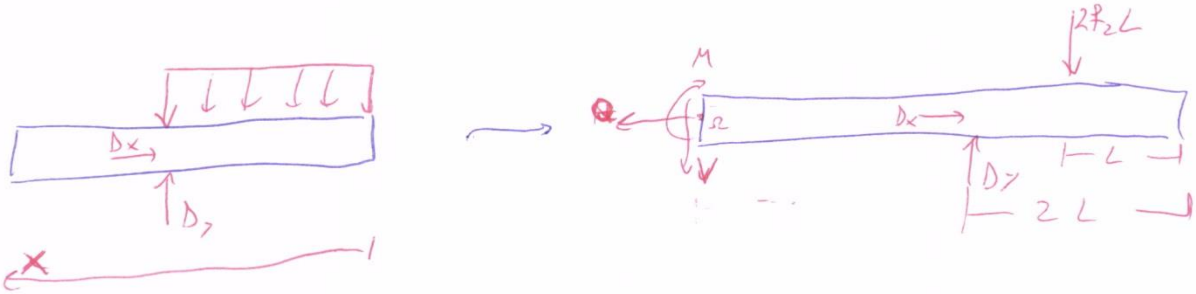
$\cdot \sum F_x = 0 \rightarrow \boxed{Q = 0}$

$\cdot \sum F_y = 0 \rightarrow \boxed{V(x) = q_2 x} = 50x$

$\cdot \sum_{\Omega} M_z = 0 \rightarrow -\frac{x}{2} \cdot q_2 x - M(x) = 0$

$$\boxed{M(x) = \frac{q_2 x^2}{2}} = 25x^2$$

(ii) $2L < x < 5L$



$\cdot \sum F_x = 0 \rightarrow Q = D_x = 100$

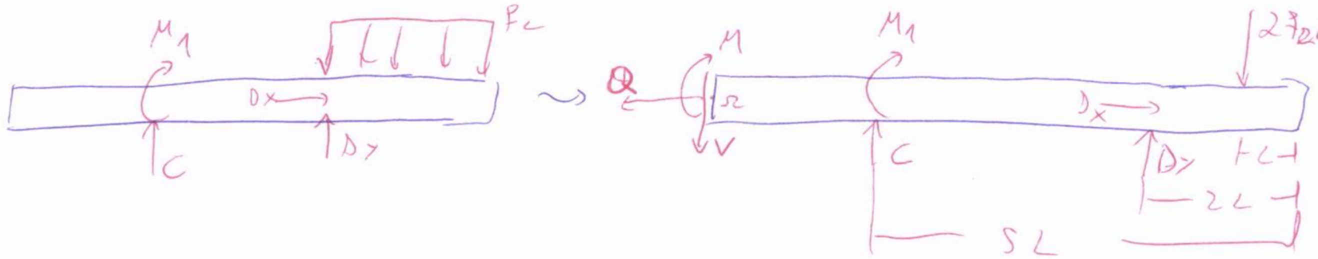
$\cdot \sum F_y = 0 \rightarrow D_y - 2q_2L - V(x) = 0 \rightarrow V(x) = 2q_2L - D_y = -36{,}67$

$\cdot \sum_{\Omega} M_z = 0 \rightarrow -M(x) + D_y(x-2L) - 2q_2L(x-L) = 0$

$$\boxed{\therefore M(x) = D_y(x-2L) - 2q_2L(x-L)}$$

$$M(x) = 36{,}67x - 73{,}34$$

(iii) $5L < x < 6L$



$\cdot \sum F_x = 0 \rightsquigarrow \boxed{Q = D_x = 100}$

$\cdot \sum F_y = 0 \rightsquigarrow -V + C + D_y - 2q_2L = 0$

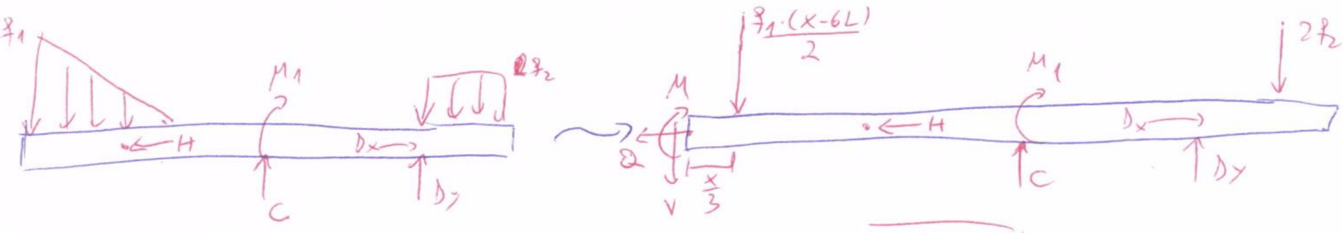
$$\boxed{V = C + D_y - 2q_2L = 50}$$

$\cdot \sum_{\Omega} M_z = 0 \rightsquigarrow -M(x) - M_1 + C(x-5L) + D_y(x-2L) + 2q_2L(-x-L) = 0$

$$M(x) = -(2q_2L - D_y - C)x - M_1 + (5LC + 2LD_y - 2q_2L^2)$$

$$\boxed{M(x) = -50x + 299{,}99}$$

(iv) $6L < x < 10L$



$\cdot \sum F_x = 0 \rightsquigarrow -Q - H + D_x = 0 \rightsquigarrow \boxed{Q = 0}$

$\cdot \sum F_y = 0 \rightsquigarrow -\frac{q_1}{2}(x-6L) + C + D_y - 2q_2L - V = 0$

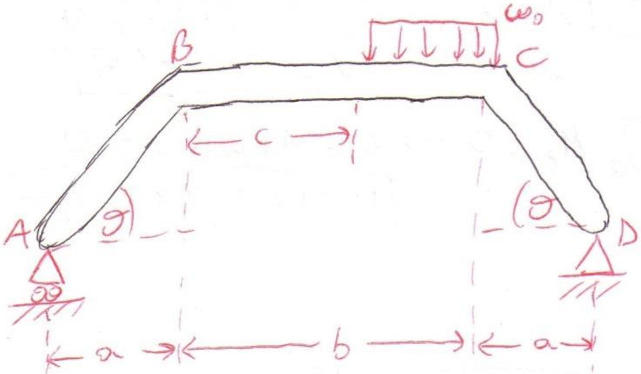
$$V(x) = -\frac{q_1}{2}x + 3q_1L + C + D_y - 2q_2L$$

$$\boxed{V(x) = -37{,}5x + 275}$$

$\cdot \sum_{\Omega} M_z = 0 \rightsquigarrow -\frac{q_1}{6}x(x-6L) + C(x-5L) + D_y(x-\cancel{2L}) - 2q_2L(x-L) - M(x) - M_1 = 0$

$$M(x) = -M_1 - \frac{q_1}{6}x^2 + (C + D_y - 2q_2L + q_1L)x - 5LC - 2LD_y + 2q_2L^2$$

$$\boxed{M(x) = -12{,}5x^2 + 125x - 239{,}99}$$



$\omega_0 = 1000\ N/m$

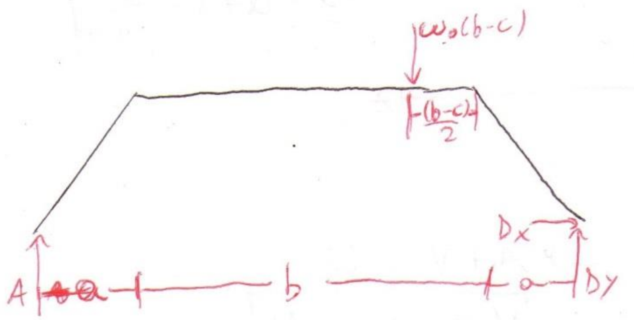
$a = 1\ m$

$b = 3\ m$

$c = 2\ m$

$\theta = 30°$

* DCL y cálculo reacciones



$\cdot \sum F_x = 0 \Rightarrow D_x = 0$

$\cdot \sum F_y = 0 \Rightarrow A - \omega_0(b-c) + D_y = 0$

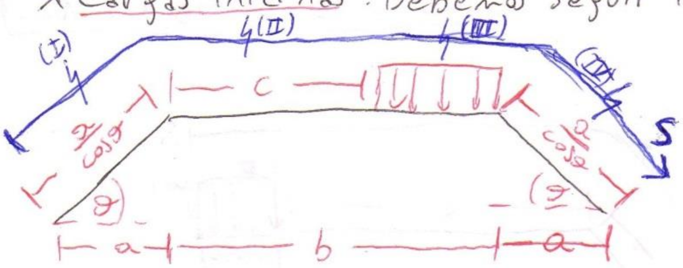
$D_y = \omega_0(b-c) - A \quad (i)$

$\cdot \sum_D M_z = 0 \Rightarrow -A(2a+b) + \left(a + \frac{b-c}{2}\right)\omega_0(b-c) = 0$

$$\boxed{\therefore A = \frac{\omega_0(2a+b-c)(b-c)}{2(2a+b)} = 300\ N}$$

en (i) $\boxed{D_y = 700\ N}$

* Cargas internas: Debemos seguir la línea de la viga (coordenada S)

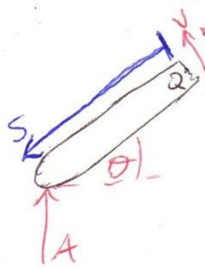


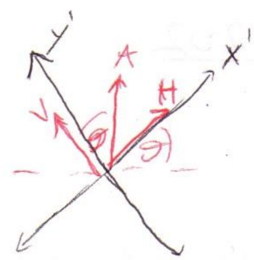
Se realizarán 4 cortes, cuya orientación dependerá de la orientación de la viga:

I) $0 < S < \frac{a}{\cos\theta}$ // II) $\frac{a}{\cos\theta} < S < \frac{a}{\cos\theta} + c$

III) $\frac{a}{\cos\theta} + c < S < \frac{a}{\cos\theta} + b$ // IV) $\frac{a}{\cos\theta} + b < S < \frac{2a}{\cos\theta} + b$

I) $0 < S < \frac{a}{\cos\theta}$





- $\sum F_{x'} = 0 \Rightarrow H + A \cdot \operatorname{Sen}\theta = 0$

$\boxed{H = -150 \text{ N}}$

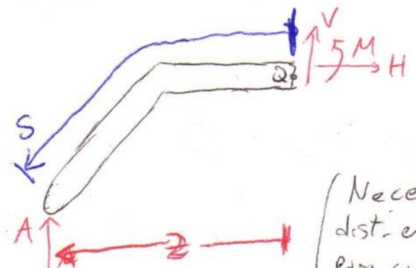
- $\sum F_{y'} = 0 \Rightarrow V + A \cdot \cos\theta = 0$

$\boxed{V = -259{,}81 \text{ N}}$

- $\sum_Q M_z = 0 \Rightarrow M - A\cos\theta \cdot S = 0$

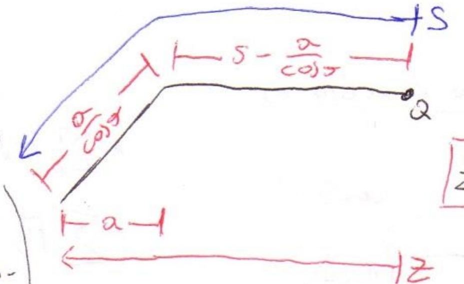
$\boxed{M(S) = 259{,}8 \cdot S \text{ N·m}}$

II) $\frac{a}{\cos\theta} < S < \frac{a}{\cos\theta} + c$



(Necesitamos la dist. entre Q y A para calcular el momento ~~pro~~ducido por A)

$\Rightarrow$



$\boxed{Z = a + S - \frac{a}{\cos\theta}}$

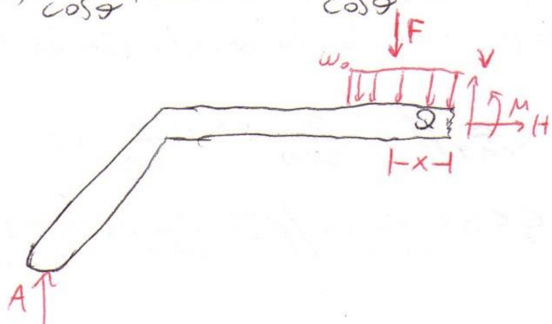
- $\sum F_x = 0 \Rightarrow H = 0$ // $\sum F_y = 0 \Rightarrow A + V = 0$

$\boxed{V = -300 \text{ N}}$

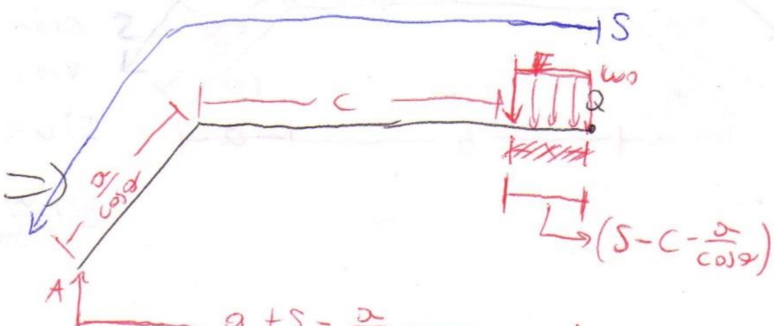
- $\sum_Q M_z = 0 \Rightarrow M - A \cdot \left(a + S - \frac{a}{\cos\theta}\right) = 0 \Rightarrow M(S) = A\left(a - \frac{a}{\cos\theta}\right) + AS$

$\boxed{M(S) = 300 \cdot S - 46{,}41 \text{ N·m}}$

III) $\frac{a}{\cos\theta} + c < S < \frac{a}{\cos\theta} + b$



$\Rightarrow$



* Necesitamos la distancia que alcanza el corte en la fza distribuida para calcular su equivalente y la distancia al punto Q. Luego:

$$\Rightarrow F = \omega_0\left(S - c - \frac{a}{\cos\theta}\right) \wedge X = \frac{1}{2}\left(S - c - \frac{a}{\cos\theta}\right)$$

$$\cdot \sum F_x = 0 \Rightarrow H = 0 \quad // \quad \sum F_y = 0 \Rightarrow A - \omega_0\left(S - c - \frac{a}{\cos\theta}\right) + V = 0$$

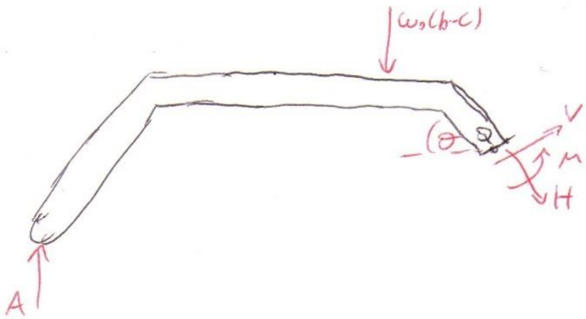
$$\boxed{V(S) = 1000 \cdot S - 3454{,}7}$$

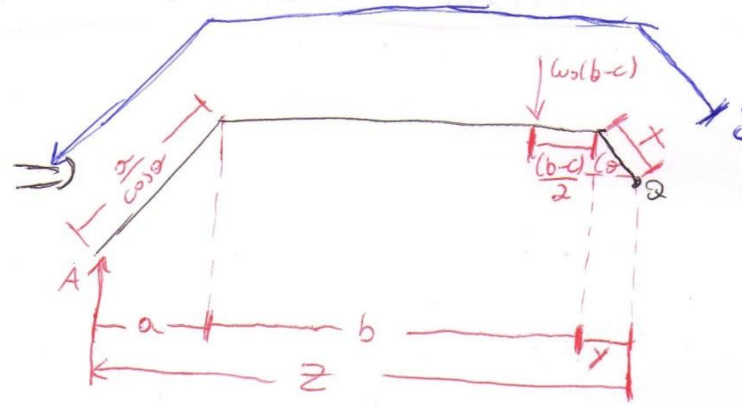
$$\cdot \sum_{\mathrm{a}} M_z = 0 \Rightarrow -A\left(a + S - \frac{a}{\cos\theta}\right) + \frac{\omega_0}{2}\left(S - c - \frac{a}{\cos\theta}\right)^2 + M$$

$$M(S) = \left(A\alpha - \frac{\omega_0}{2}\beta^2\right) + \left(A - \omega_0\beta\right)S - \frac{\omega_0}{2}S^2 \quad // \quad \alpha = a - \frac{a}{\cos\theta}, \quad \beta = c + \frac{a}{\cos\theta}$$

$$\boxed{M(S) = -5023{,}51 + 2855{,}5 - 500\,S^2}$$

IV) $\frac{a}{\cos\theta} + b < S < \frac{2a}{\cos\theta} + b$

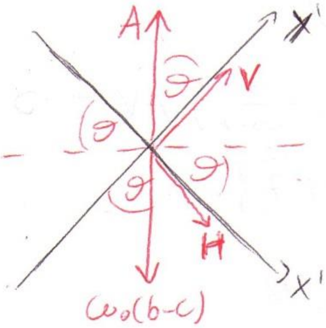




*Para encontrar la distancia z, necesitamos saber y, que puede extraerse des de x:

$$X = S - \frac{a}{\cos\theta} - b \Rightarrow Y = \left(S - \frac{a}{\cos\theta} - b\right)\cos\theta = (S-b)\cos\theta - a$$

$$\boxed{\therefore z = (S-b)\cos\theta + b}$$



- $\sum F_{x'} = 0 \Rightarrow H + \omega_0(b-c)\operatorname{sen}\theta - A\operatorname{sen}\theta = 0$

$$\boxed{H = (A - \omega_0(b-c))\operatorname{sen}\theta = -350\ N}$$

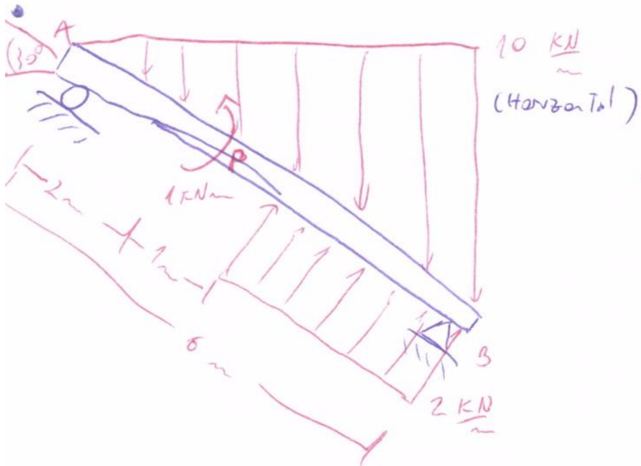
- $\sum F_{y'} = 0 \Rightarrow V + A\cos\theta - \omega_0(b-c)\cos\theta = 0$

$$\boxed{V = (\omega_0(b-c) - A)\cos\theta = 606{,}22\ N}$$

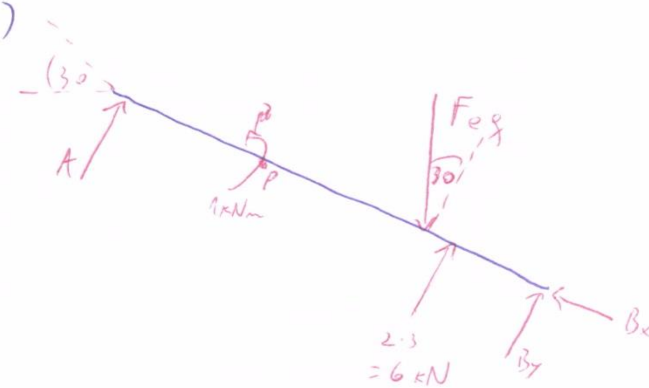
- $\sum_a M_z = 0 \Rightarrow -((s-b)\cos\theta + b)A + \left((s-b)\cos\theta - a + \frac{b-c}{2}\right)\omega_0(b-c) + M = 0$

$$M(s) = \alpha\cdot s + \beta, \text{ con} \begin{cases} \alpha = A\cos\theta - \omega_0(b-c)\cos\theta \\ \beta = Ab(1-\cos\theta) - \omega_0(b-c)\left(b\cos\theta - a + \left(\frac{b-c}{2}\right)\right) \end{cases}$$

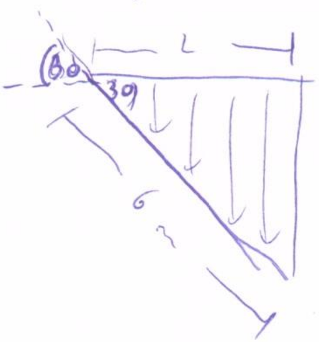
$$\boxed{M(s) = -606{,}22\cdot s - 1977{,}5}$$



DCL



* Feq:

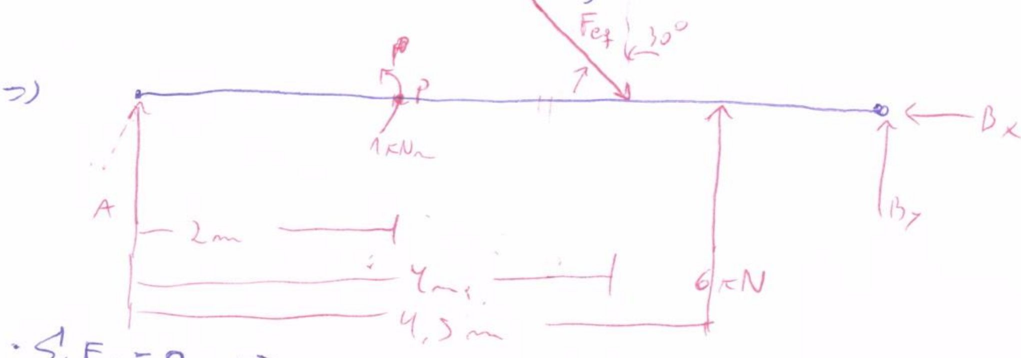


$\Rightarrow \cos(30) = \frac{L}{6} \Rightarrow L = 6\cdot\cos(30) = 5{,}196$

$\Rightarrow F_{eq} = \frac{10\cdot L}{2} = 25{,}98\ kN$

$\Rightarrow \bar{x}_{eq} = \frac{2}{3}\cdot 6\cdot\cos(30) \Rightarrow \bar{x}_{eq} = 3{,}464\ m$

$\Rightarrow$



- $\sum F_x = 0 \Rightarrow B_x = F_{eq}\ \text{Sen}\ 30 = 12{,}99\ kN$

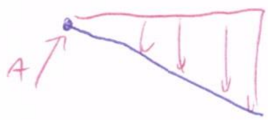
- $\sum F_y = 0 \Rightarrow A - F_{eq}\cos 30 + 6 + B_y = 0 \Rightarrow \boxed{B_y = 6{,}99 - A}\ (*)$

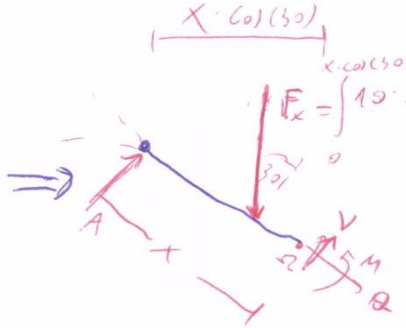
- $\sum_B M_z = 0 \Rightarrow -6A + 1 + 2F_{eq}\cos 30 - 6\cdot 1{,}5 = 0$

$\boxed{\therefore A = 6{,}166\ kN} \underset{en(*)}{\Rightarrow} \boxed{B_y = 0{,}824\ kN}$

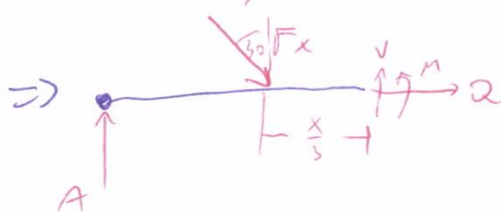
* <u>Cargas internas:</u>

↳ $0 < x < 2$





$F_x = \int_0^{x\cdot\cos(30)} 10\cdot\frac{x}{6}\,dx = \frac{10}{6}\cdot\frac{1}{2}x^2\cos(30) = 0{,}722\,x^2$



· $\sum F_x = 0 \Rightarrow Q + F_x \,\text{sen}(30) = 0 \Rightarrow \boxed{Q(x) = 0{,}361\,x^2 \text{ kN}}$

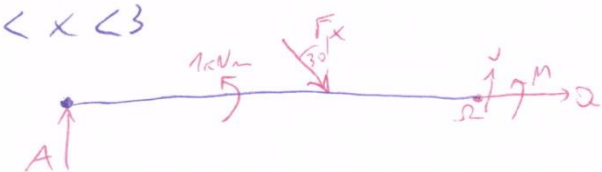
· $\sum F_y = 0 \Rightarrow A - F_x\cos(30) + V(x) = 0$

$\boxed{\therefore V(x) = F_x\cos(30) - A = 0{,}625\,x^2 - 6{,}166 \text{ kN}}$

· $\sum_\Omega M_z = 0 \Rightarrow -Ax + \frac{x}{3}F_x\,\text{sen}(30) + M(x) = 0$

$\boxed{M(x) = Ax - \frac{x}{3}F_x\,\text{sen}(30) = 6{,}166x - 0{,}12\,x^3}$

↳ $2 < x < 3$



$Q(x) = 0{,}361\,x^2$ kN

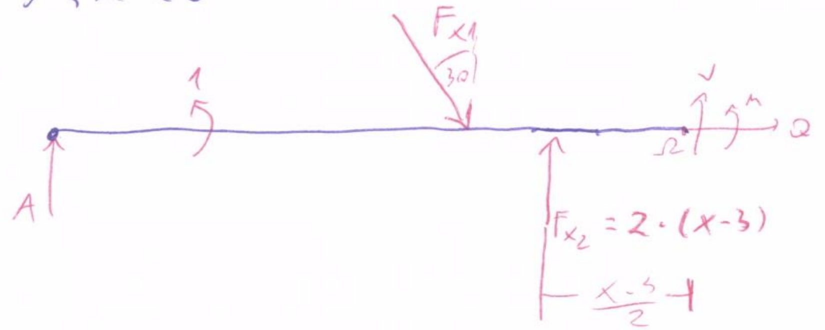
$V(x) = 0{,}625\,x^2 - 6{,}166$ kN

· $\sum_\Omega M_z = 0 \rightsquigarrow -Ax + F_x\,\text{sen}(30)\cdot\frac{x}{3} + 1 + M(x) = 0$

$\boxed{M(x) = 6{,}166x - 0{,}12\,x^3 - 1}$

↳ ~~3 < x <~~ 6

↳ $3 < x \leqslant 6$



• $Q(x) = 0{,}361\, x^2$ kN

• $V(x) = 0{,}625\, x^2 - 6{,}166$ kN

• $\sum^{\circlearrowleft}_{\Omega} M_z = 0 \rightsquigarrow -Ax + 1 + F_{x_1} \cos 30 \cdot \frac{x}{3} - \frac{2(x-3)^2}{2} + M(x) = 0$

$$\boxed{M(x) = 6{,}166\, x - 0{,}12\, x^3 - 1 + (x-3)^2}$$