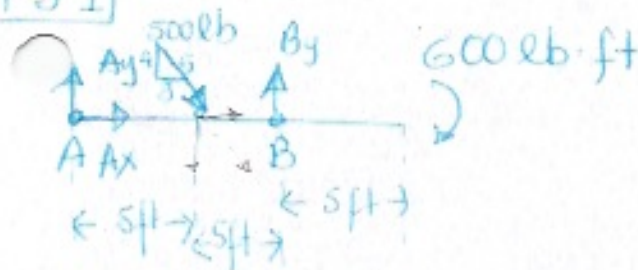


Ejercicios sobre Soportes Híbridos

F5-1



$$\sum F_x = 0:$$

$$A_x + 500 \text{ lb} \left(\frac{3}{5}\right) = 0 \quad \text{ecu (1)}$$

$$\Rightarrow A_x = -300 \text{ lb}$$

$$\sum F_y = 0:$$

$$A_y - 500 \left(\frac{4}{5}\right) + B_y = 0$$

$$A_y + B_y = 400 \quad \text{ecu (2)}$$

$$\sum M_A = 0:$$

$$-(400 \text{ lb})(10 \text{ ft}) + 10 \text{ ft} B_y - 600 \text{ lb} \cdot \text{ft} = 0$$

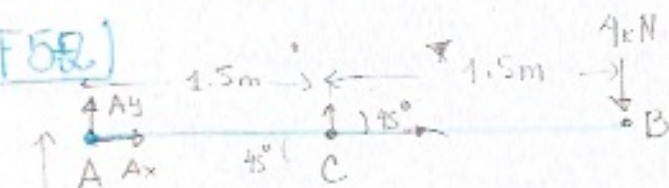
$$2000 \text{ lb} \cdot \text{ft} - 600 \text{ lb} \cdot \text{ft} + 10 B_y = 0$$

$$10 B_y = 2600 \text{ lb} \cdot \text{ft}$$

$$B_y = 260 \text{ lb}$$

$$\Rightarrow \boxed{A_x = -300 \text{ lb}, \quad A_y = 140 \text{ lb}, \quad B_y = 260 \text{ lb}}$$

F5-2



$$\Rightarrow \vec{F}_{DC} = (F_{DC} \cos 45^\circ, F_{DC} \sin 45^\circ)$$

$$\Rightarrow \sum F_x = 0:$$

$$A_x + F_{DC} \cos 45^\circ = 0 \quad \text{ecu (1)}$$

$$\sum F_y = 0:$$

$$A_y + F_{DC} \sin 45^\circ = 4 \text{ kN} \quad \text{ecu (2)}$$

$$\sum M_A = 0:$$

$$1.5 F_{DC} \sin 45^\circ - (4 \text{ kN})(3 \text{ m}) = 0$$

$$\Rightarrow 1.5 F_{DC} \sin 45^\circ = 12 \text{ kN} \cdot \text{m}$$

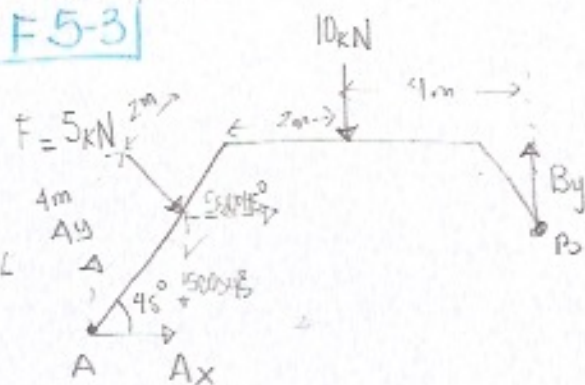
$$\Rightarrow F_{DC} = \frac{12000 \text{ N} \cdot \text{m}}{1.5 \sin 45^\circ}$$

$$\boxed{F_{DC} = 11.314 \text{ kN}}$$

$$\therefore A_x = -\cos 45^\circ (11.314 \text{ kN}) = \boxed{-8 \text{ kN}}$$

$$\boxed{A_y = 4 \text{ kN}}$$

F5-3



$$\vec{F} = 5 \text{ kN} (\sin 45^\circ, -\cos 45^\circ)$$

luego

$$\sum F_x = 0: A_x + 5 \text{ kN} \sin 45^\circ = 0 \Rightarrow \boxed{A_x = -3.54 \text{ kN}}$$

$$\sum F_y = 0: A_y - 5 \text{ kN} \cos 45^\circ - 10 \text{ kN} + B_y = 0$$

$$\Rightarrow A_y + B_y = 13.54 \text{ kN} \quad \text{ecu (1)}$$

$$\sum M_A = 0:$$

$$-(5 \text{ kN} \cos 45^\circ)(4 \text{ m} \cos 45^\circ) - (5 \text{ kN} \sin 45^\circ)(4 \text{ m} \sin 45^\circ)$$

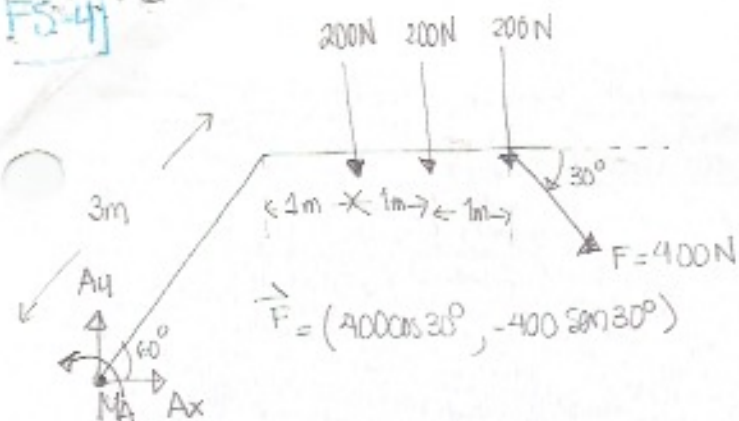
$$- (10 \text{ kN})(6 \text{ m} \cos 45^\circ + 2 \text{ m}) + (B_y)(6 \cos 45^\circ + 6 \text{ m}) = 0$$

$$\hookrightarrow -10 \text{ kN} \cdot \text{m} - 10 \text{ kN} \cdot \text{m} - 62.43 \text{ kN} \cdot \text{m} + 10.24 \text{ m} B_y = 0$$

$$\Rightarrow B_y = \frac{82.43 \text{ kN} \cdot \text{m}}{10.24 \text{ m}} = \boxed{8.05 \text{ kN}}$$

$$\Rightarrow \boxed{A_y = 5.49 \text{ kN}}$$

FS-4j



$$\sum F_x = 0: A_x + 400 \cos 30^\circ = 0$$

$$\Rightarrow \boxed{A_x = -346.4 \text{ N}}$$

$$\sum F_y = 0: A_y - 600 \text{ N} - 400 \text{ sen } 30^\circ = 0$$

$$\Rightarrow A_y = 800 \text{ N}$$

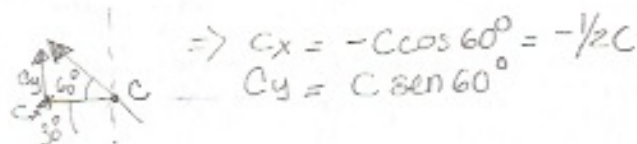
$$\sum M_A = 0:$$

$$M_A - (3 \text{ m} \cos 60^\circ + 1 \text{ m})(200 \text{ N}) - (3 \text{ m} \cos 60^\circ + 2 \text{ m})(200 \text{ N}) - (3 \text{ m} \cos 60^\circ + 3 \text{ m})(200 \text{ N}) - (3 \text{ m} \cos 60^\circ + 3 \text{ m})(400 \text{ sen } 30^\circ) - (400 \cos 30^\circ)(3 \text{ m} \cos 60^\circ) = 0$$

$$M_A - 500 \text{ N} \cdot \text{m} - 700 \text{ N} \cdot \text{m} - 900 \text{ N} \cdot \text{m} - 900 \text{ N} \cdot \text{m} - 900 \text{ N} \cdot \text{m} = 0$$

$$\boxed{M_A = 3900 \text{ N} \cdot \text{m}}$$

Detalle de la reacción en C:



$$\sum F_x = 0:$$

$$-\frac{C}{2} + T_{AB} \cos 15^\circ = 0 \quad \text{ecu (1)}$$

$$\sum F_y = 0:$$

$$A_y + T_{AB} \sin 15^\circ - G + C \text{ sen } 60^\circ = 0$$

$$\Rightarrow A_y + T_{AB} \sin 15^\circ + C \text{ sen } 60^\circ = G \quad \text{ecu (2)}$$

$$\sum M_{\text{ext}} = 0 \Rightarrow \sum M_A = 0 \text{ y así eliminamos } T_{AB} \text{ y } A_y.$$

$$\Rightarrow - (0.5 \text{ m} \cos 30^\circ)(G) + (C \text{ sen } 60^\circ)(0.7 \text{ m} \cos 30^\circ) + (0.5 C)(0.7 \text{ m} \text{ sen } 30^\circ) = 0$$

$$\Rightarrow -106.196 \text{ N} \cdot \text{m} + 0.525 \text{ m} C + 0.175 \text{ m} C = 0$$

$$\Rightarrow 0.7 \text{ m} C = 106.196 \text{ N} \cdot \text{m}$$

$$C = 106.196 \text{ N} \cdot \text{m} / 0.7 \text{ m}$$

$$\boxed{C = 151.7 \text{ N}}$$

de la ecu (1)

$$\Rightarrow T_{AB} = \frac{C}{2 \cos 15^\circ} = \frac{151.7}{2 \cos 15^\circ} = \boxed{18.53 \text{ N}}$$

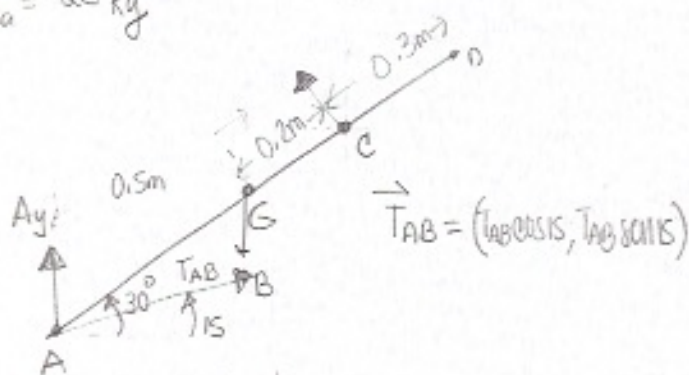
y de ecu (2)

$$A_y = G - T_{AB} \sin 15^\circ - C \text{ sen } 60^\circ$$

$$\boxed{A_y = 93.55 \text{ N}}$$

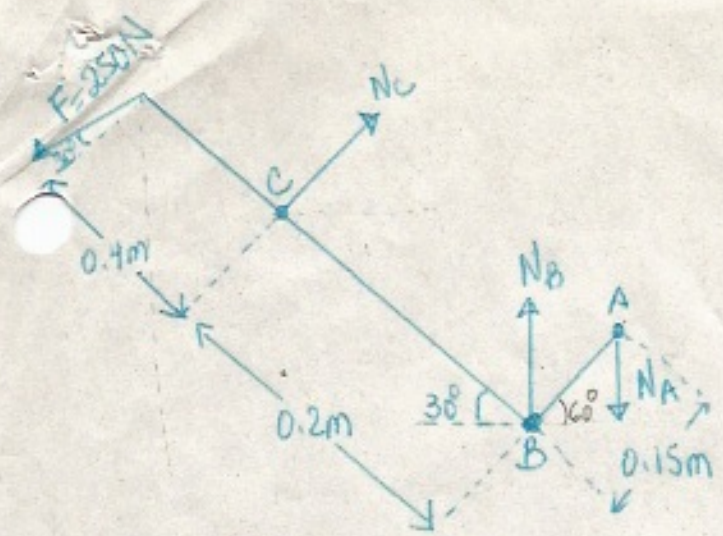
FS-5j

$$M_{\text{barra}} = 25 \text{ Kg}$$

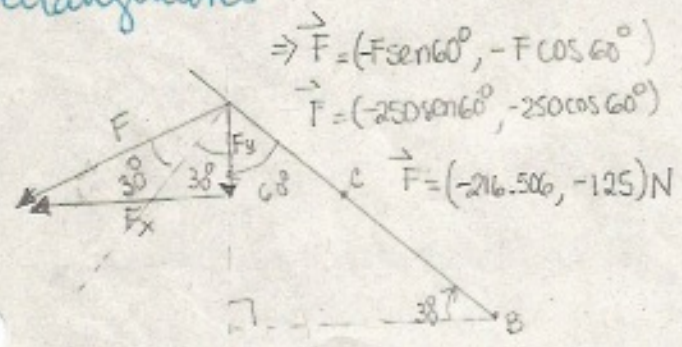


incógnitas

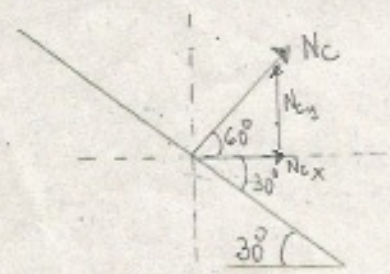
$$\vec{A}_y, \vec{T}_{AB}, \vec{C}$$



Detalles importantes para descomponer \vec{F} y \vec{N}_c es sus componentes rectangulares



$$\begin{aligned} \Rightarrow \vec{F} &= (F \sin 60^\circ, -F \cos 60^\circ) \\ \vec{F} &= (-250 \sin 60^\circ, -250 \cos 60^\circ) \\ \vec{F} &= (-216.506, -125) \text{ N} \end{aligned}$$



$$\begin{aligned} \Rightarrow \vec{N}_c &= (N_c \cos 60^\circ, N_c \sin 60^\circ) \\ \vec{N}_B &= (0, N_B) \\ \vec{N}_A &= (0, -N_A) \end{aligned}$$

Ahora planteamos $\sum F_x = 0$:

$$-216.506 \text{ N} + N_c \cos 60^\circ = 0$$

$$\Rightarrow \boxed{N_c = 433.012 \text{ N}}$$

$$\sum F_y = 0 :$$

$$-125 \text{ N} + N_c \sin 60^\circ + N_B - N_A = 0$$

= sustituimos $N_c = 433.012 \text{ N}$

$$\Rightarrow -125 \text{ N} + (433.012 \text{ N}) \sin 60^\circ + N_B - N_A = 0$$

$$N_B - N_A = -249.999 \text{ N} \dots \text{ ecu (1)}$$

luego:

$$\sum M_B = 0 :$$

$$\begin{aligned} &-(0.15 \sin 60^\circ)(N_A) - (N_{cx})(0.2 \sin 30^\circ) \\ &-(N_{cy})(0.2 \cos 30^\circ) + (F_y)(0.6 \cos 30^\circ) \\ &+(F_x)(0.6 \sin 30^\circ) = 0 \end{aligned}$$

Sustituyendo:

$$\begin{aligned} &-0.075 N_A - (216.506)(0.1 \text{ m}) \\ &-(374.999)(0.173 \text{ m}) + (125)(0.5196 \text{ m}) \\ &+(216.506)(0.3 \text{ m}) = 0 \end{aligned}$$

$$\begin{aligned} \Rightarrow &-0.075 N_A - 21.6506 \text{ N}\cdot\text{m} - 64.874827 \\ &\text{N}\cdot\text{m} + 64.95 \text{ N}\cdot\text{m} + 64.9518 \text{ N}\cdot\text{m} = 0 \\ &-0.075 N_A + 43.376373 \text{ N}\cdot\text{m} = 0 \end{aligned}$$

$$\Rightarrow \boxed{N_A = 578.35 \text{ N}}$$

usando la ecu (1).

$$\boxed{N_B = 328.35 \text{ N}}$$