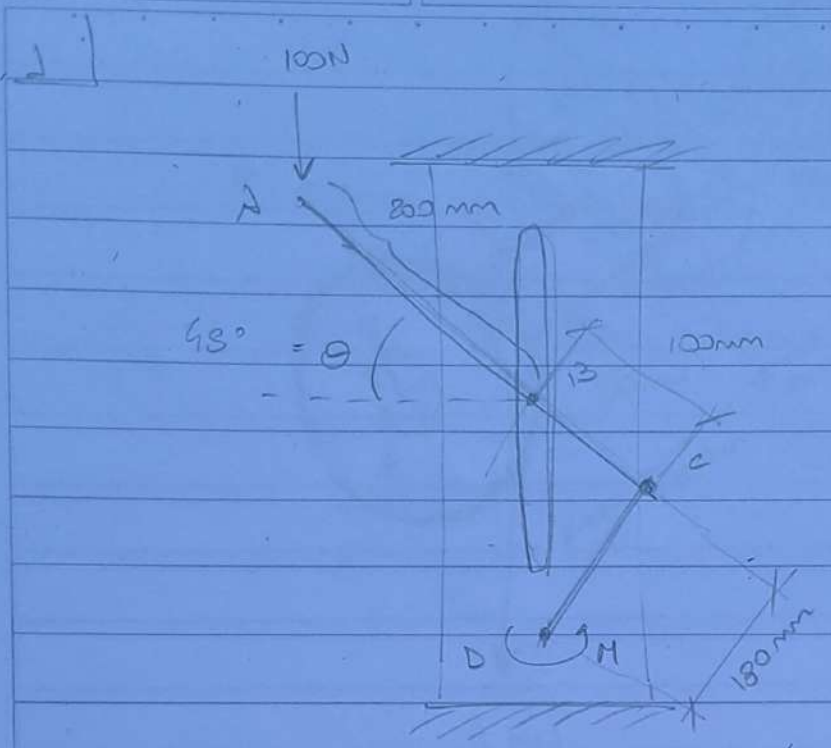
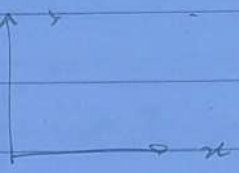
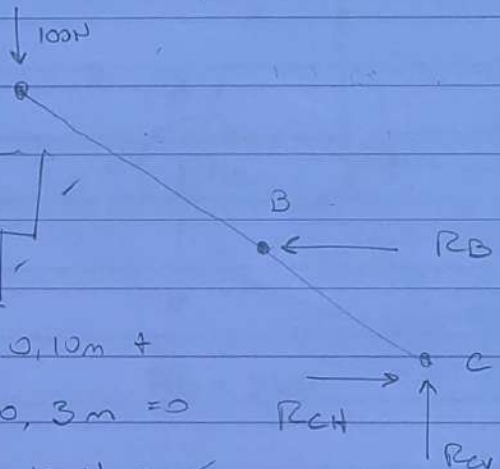
Ex. Julio 2023.





⇒ DCL ABC ⇒



$\Sigma F_y = 0 \Leftrightarrow \boxed{R_{CV} = 100N}$

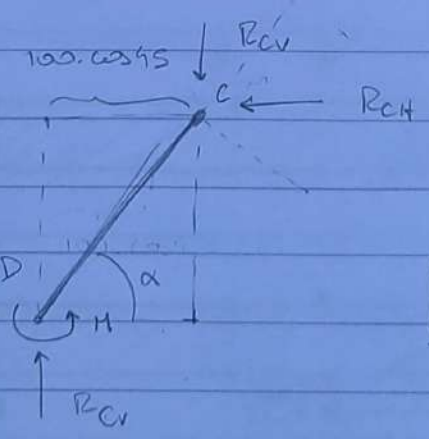
$\Sigma F_x = 0 \Leftrightarrow \boxed{R_B = R_{CH}}$

$\Sigma M_C = 0 \Leftrightarrow R_B \cdot \cos 48 \cdot 0,10m + 100N \cdot \cos 48 \cdot 0,3m = 0$

$\Rightarrow -R_B \cdot \cancel{\cos 48} \cdot 0,1m = 100N \cdot \cancel{\cos 48} \cdot 0,3m$

$R_B = \frac{-100N \cdot 0,3m}{0,1m} \Rightarrow \boxed{R_B = R_{CH} = -300N}$

⇒ DCL DC ⇒



$\cos \alpha = \frac{100 \cdot \cos 48}{180}$

$\alpha = 66,9°$

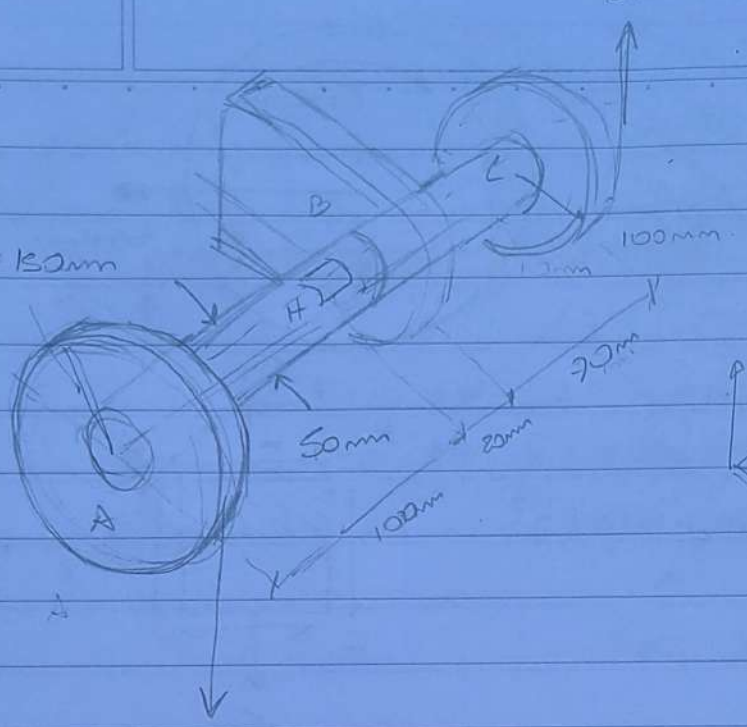
$\Sigma M_D = 0 \Leftrightarrow$

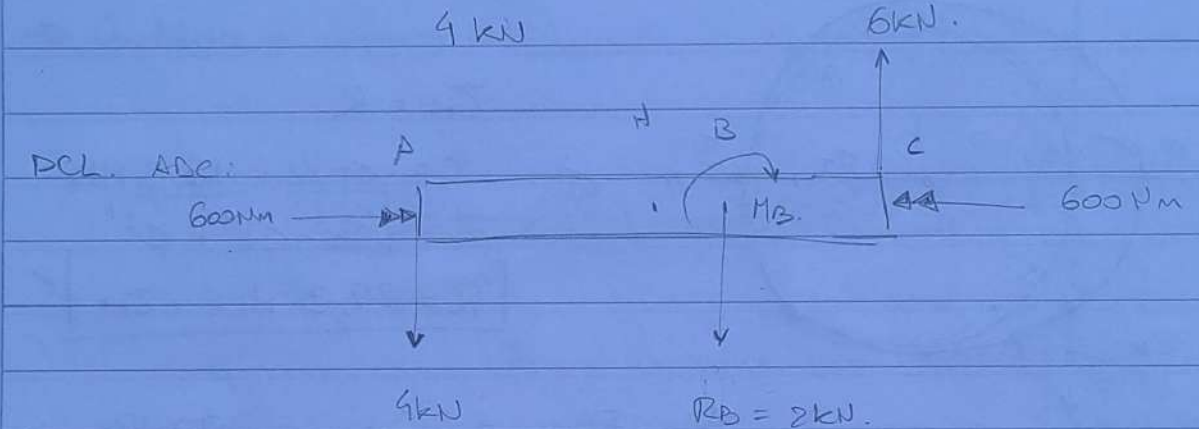
$M + R_{CH} \cdot 0,18m \cdot \sin\alpha = R_{CV} \cdot \cos 48 \cdot 0,1$

$M = 49,7Nm + 7,1Nm$

$\boxed{M = 56,8Nm}$

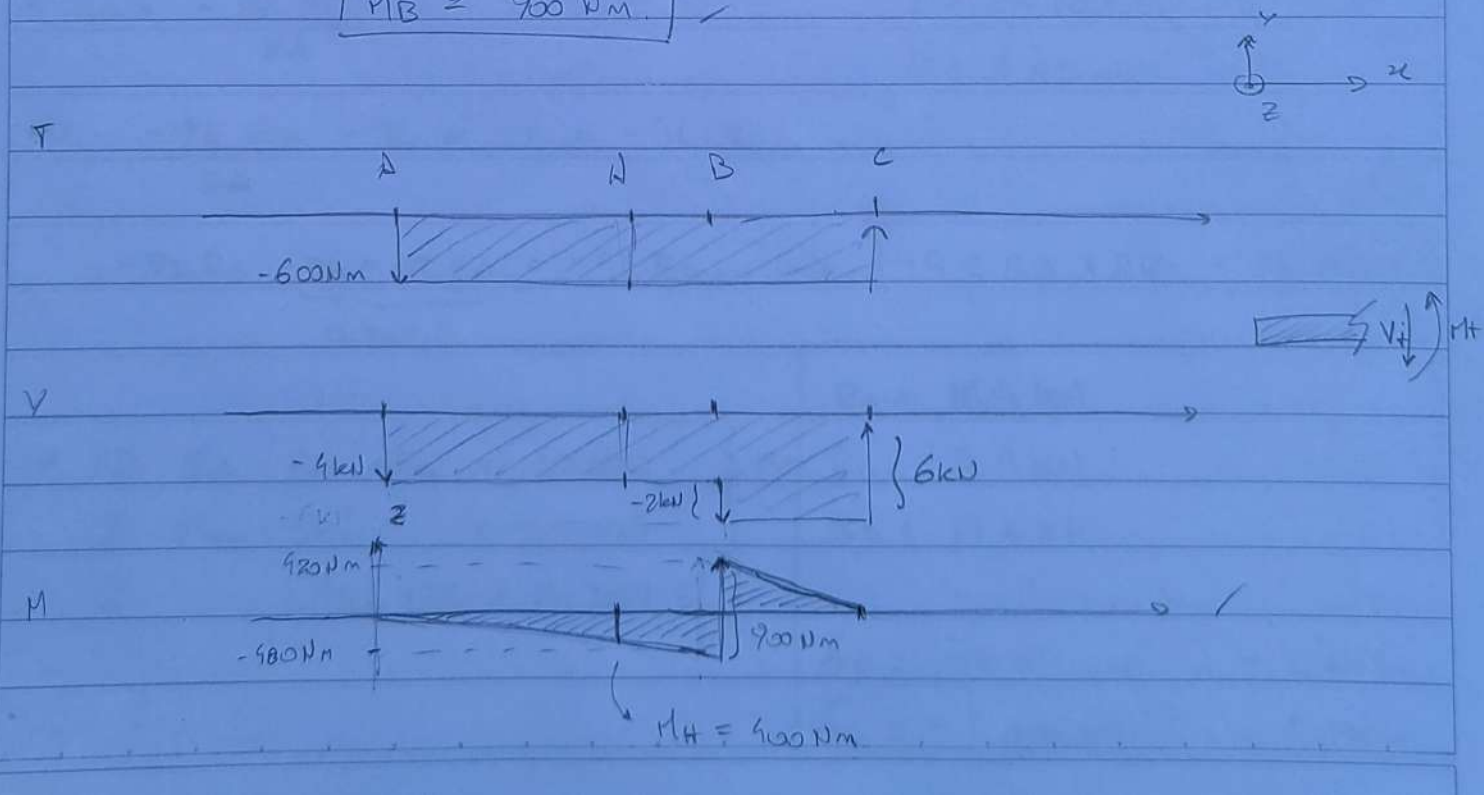
2)





$\sum M = 0 \Leftrightarrow M_B = 6kN \times 0,07m + 4kN \times 0,12m.$

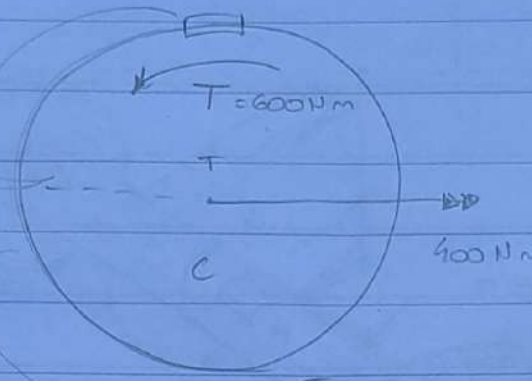
$\boxed{M_B = 900\ Nm.}$

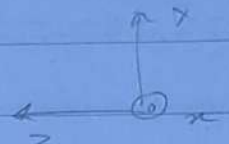


Sección H.

$$I = \frac{\pi R^4}{4} = 3{,}07 \times 10^{-7}\ m^4$$

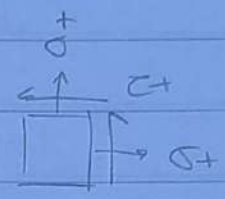
$$J = \frac{\pi R^4}{2} = 6{,}14 \times 10^{-7}\ m^4$$

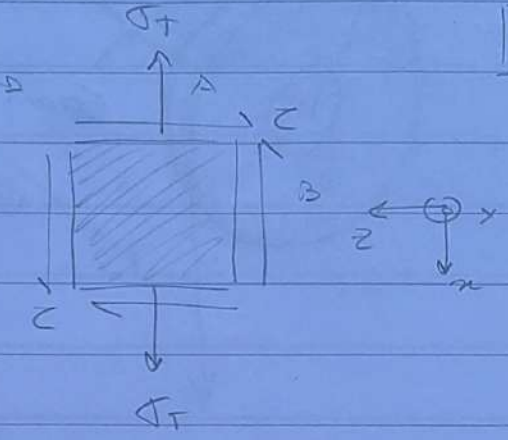


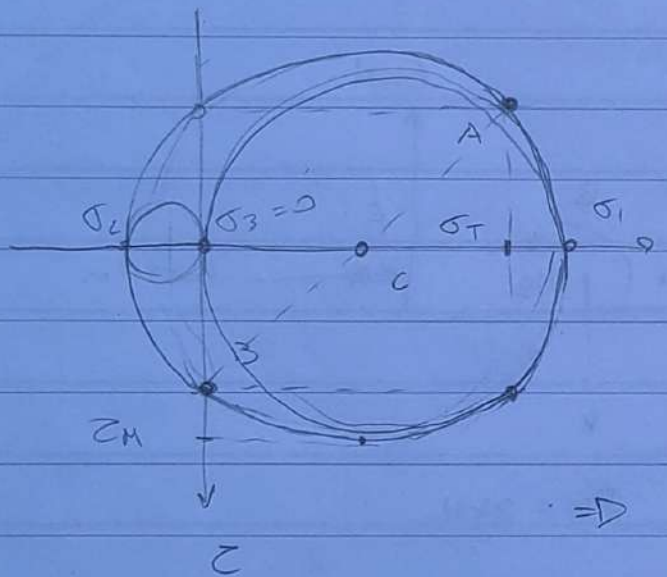


$$\sigma_T = \frac{M \cdot c}{I} = 32{,}6\ MPa$$

$$\tau = \frac{T \cdot R}{J} = 29{,}4\ MPa$$







$$\tau_M = R$$

$$c = \sigma_T / 2 = 16{,}3\ MPa$$

$$R = \sqrt{(\sigma_T - c)^2 + \tau^2}$$

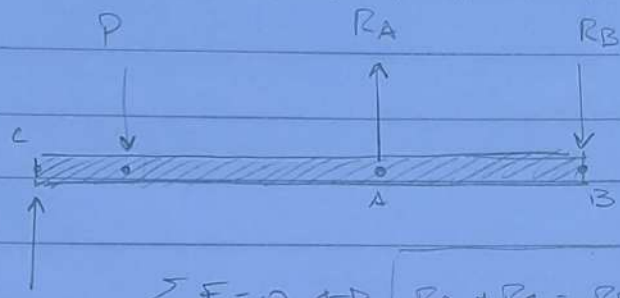
$$\boxed{R = 29{,}3\ MPa = \tau_M}$$

$$\Rightarrow FS_{3k} = \frac{S_y}{2\tau_M} = \frac{190\ MPa}{58{,}6\ MPa}$$

$$\boxed{FS_{3k} = 3{,}24}$$

2

DCL. CAB



$\Sigma F = 0 \Leftrightarrow$ $\boxed{R_A + R_C = R_B + P}$ (1)

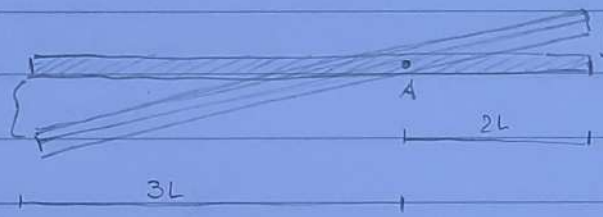
R_C $\Sigma M_C = 0 \Leftrightarrow$ $P \cdot L + R_B \cdot 5L = R_A \cdot 3L$

$\boxed{P + 5R_B = 3R_A}$ (2)

⇓

2 ecs. 3 inc. ⇒ Hiperestático.

⇒ Condición de deformación:



⇒ $\boxed{\frac{\delta_B}{2L} = \frac{\delta_C}{3L}}$ ✓

$\boxed{3\delta_B = 2\delta_C}$

- $\delta_B = \frac{-R_B \cdot 3L}{EA} - 3L \cdot \alpha \cdot \Delta T$

- $\delta_C = \frac{-R_C \cdot 2L}{EA}$

$E = 210.000.000.000\ Pa$

$A = 7,85 \times 10^{-5}\ m^2$

⇒ $\frac{-9L \cdot R_B}{EA} - 9L \cdot \alpha \cdot \Delta T = \frac{-9L \cdot R_C}{EA}$ (3) ✓

$-9L \cdot R_B \underbrace{- 9L \cdot \alpha \cdot \Delta T \cdot EA}_{17.367,5} = -9L R_C$ ⇒ $\boxed{-4,5 R_B + 2R_C = 17.367,5}$

⇒ (1) $R_A - R_B + R_C = 30.000$

(2) $3R_A - 5R_B = 30.000$

(3) $-4,5R_B + 2R_C = 17.367,5$

⇒

$R_A = 16,4$ kN

$R_B = 3,8$ kN

$R_C = 17,6$ kN.

(compresión)

$\delta_B = -6,97 \times 10^{-4}\ m = 0,697\ mm$

$\delta_C = -1,046 \times 10^{-3}\ m = 1,046\ mm$