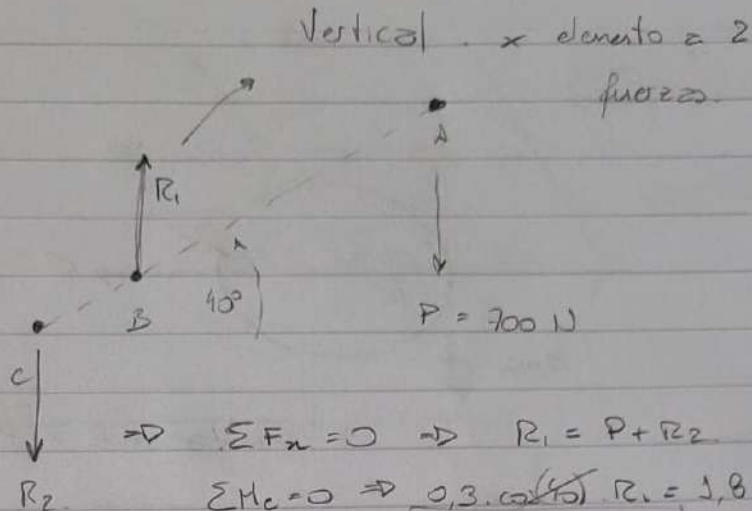
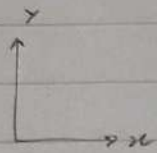


Ejercicio 1 | 2)

DCL ABC



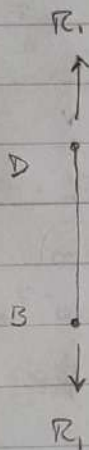
$$\Rightarrow \sum F_x = 0 \Rightarrow R_1 = P + R_2$$

$$\sum M_C = 0 \Rightarrow 0,3 \cdot \cos(40) R_1 = 1,8 \cdot 700 \cdot \cos(40)$$

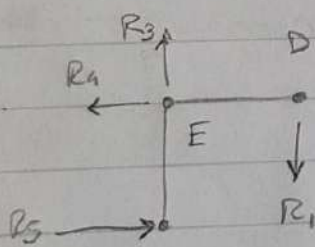
$$R_1 = 4200 \text{ N}$$

$$\Rightarrow R_2 = 3500 \text{ N}$$

DCL BD



DCL ED



$$\sum F_x = 0 \Rightarrow R_4 = R_5$$

$$\sum F_y = 0 \Rightarrow R_1 = R_3$$

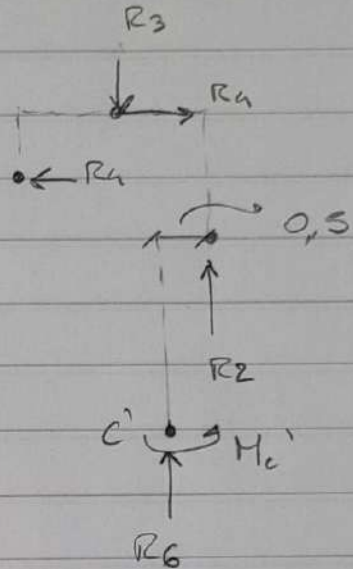
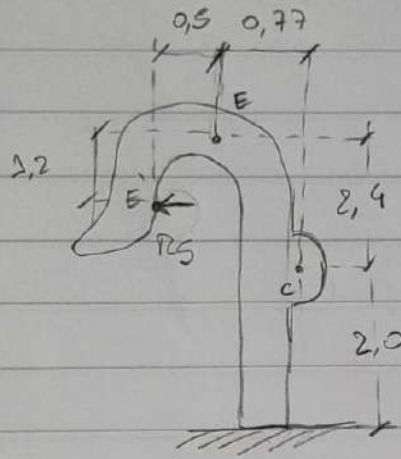
$$\sum M_E = 0 \Rightarrow R_1 \cdot 0,6 = R_3 \cdot 0,36$$

$$R_3 = 7000 \text{ N}$$

Fuerza a la que está sometida la rama

b) Si fueran reacciones en empotramiento \Rightarrow

DCL CF



$$\cdot \sum F_x = 0 \Rightarrow R_6 + R_2 = R_3$$

$$\boxed{R_6 = 700 \text{ N}} = P \checkmark$$

$$\cdot \sum M_{c'} = 0 \Rightarrow M_{c'} + R_2 \cdot 0,15 + 0,235 \cdot R_3 + 0,96 \cdot R_4 = 1,32 R_4$$

$$M_{c'} + 0,15 R_2 + 0,235 R_3 = 0,36 R_4$$

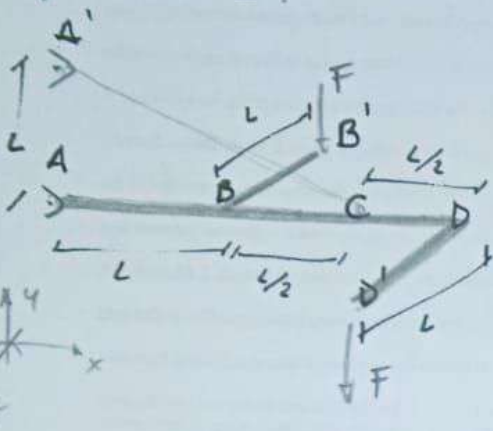
$$M_{c'} = 0,36 R_4 - 0,15 R_2 - 0,235 R_3$$

$$\boxed{M_{c'} = 1029 \text{ Nm}} \checkmark$$

EXAMEN TIM 52

Feb/23

Ejercicio 2.



$E = 210 \text{ GPa}$
 $\sigma_y = 280 \text{ MPa}$
 $D = 50 \text{ mm}$
 $e = 3 \text{ mm}$
 $F = 750 \text{ N}$

$$l = \sqrt{\left(\frac{3L}{2}\right)^2 + L^2} = 1,4422$$

$$\cos(\alpha) = \frac{L}{l} = 0,555$$

$$\sin(\alpha) = \frac{3L}{2l} = 0,832$$

$$\alpha = 33,7^\circ$$

1) $\sum F_v = 0 \Leftrightarrow 2F = F_T \sin(\alpha) + F_{AV}$

2) $\sum F_H = 0 \Leftrightarrow F_{AH} = F_T \cos(\alpha)$

3) $\sum M_A = 0 \Leftrightarrow LF + 2LF = \frac{3L}{2} F_T \sin(\alpha)$

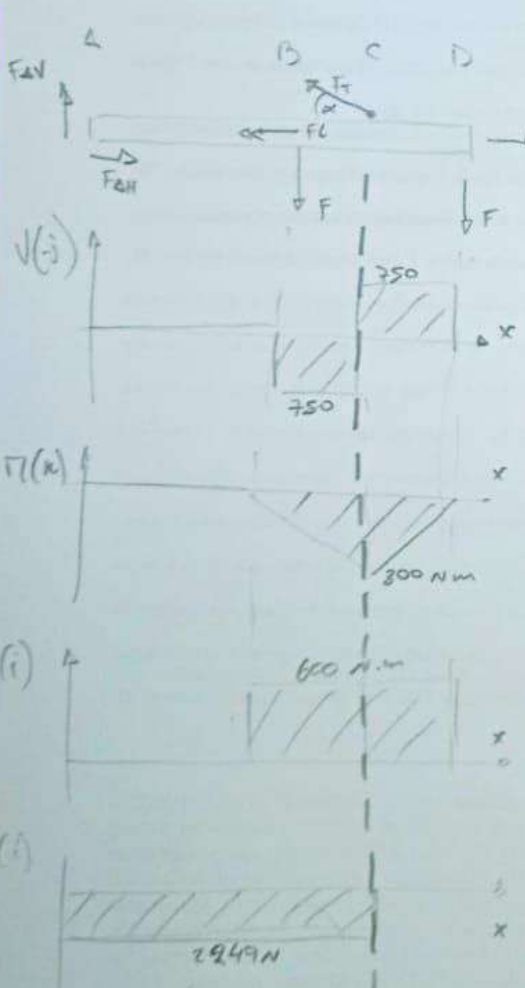
$$L \Rightarrow F_T = \frac{3LF \cdot 2}{3L \sin(\alpha)}$$

$$F_T = \frac{2F}{\sin(\alpha)} = 2703 \text{ N}$$

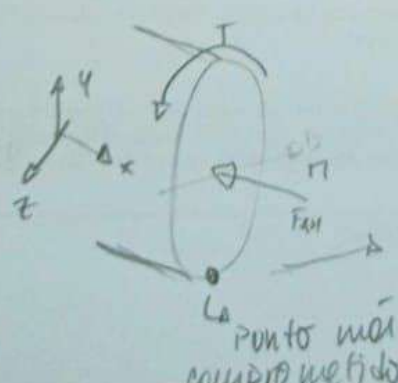
1) $2F - \frac{2F}{\sin(\alpha)} \sin(\alpha) = F_{AV} = 0$

2) $F_{AH} = 2249 \text{ N}$

$T = FL = 600 \text{ Nm}$



Sección "C"
la más comprimida.



$$I = \frac{\pi}{64} (D^4 - (D-2e)^4) = 1,23 \times 10^{-7} \text{ m}^4$$

$$A = \frac{\pi D^2}{4} = 1,96 \times 10^{-3} \text{ m}^2$$

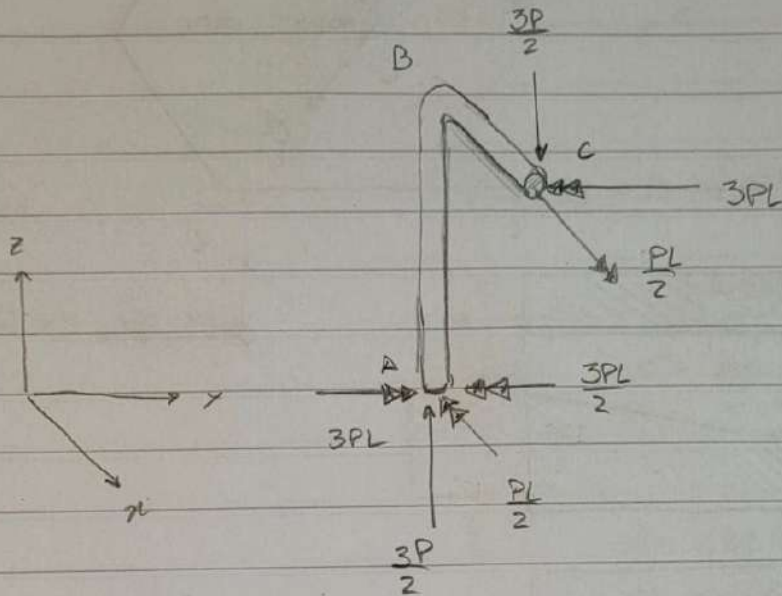
$$\sigma = \frac{F_{AH}}{A} = 61 \text{ MPa}$$

$$\tau = \frac{T}{J} = 61 \text{ MPa}$$

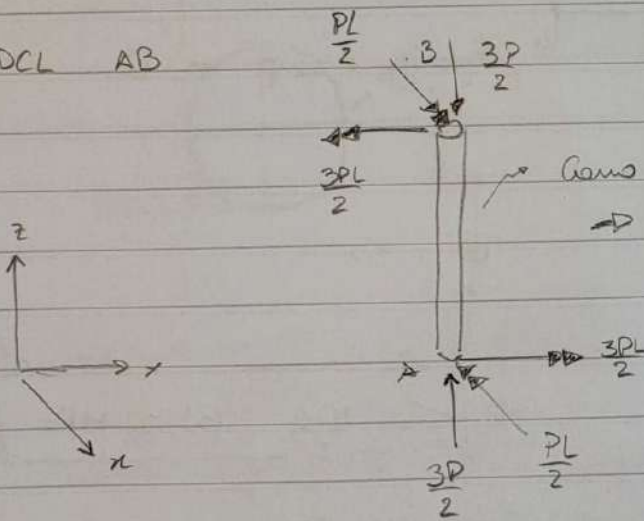
$$FS = \frac{\sigma_y}{\sqrt{\left(\frac{\sigma}{2}\right)^2 + \tau^2}} = 1,83$$

Ejercicio 3

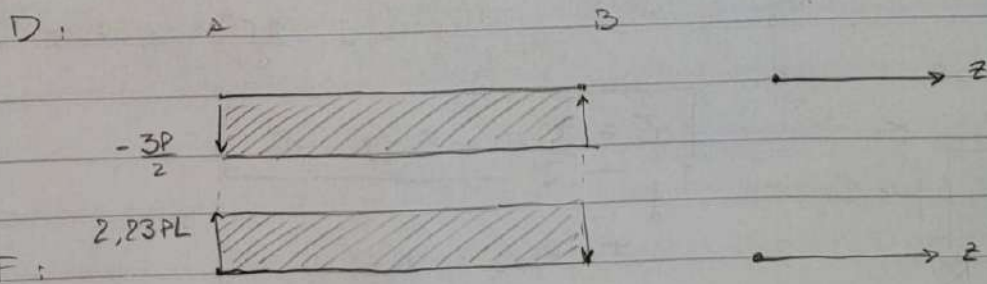
a) DCL ABC



b) DCL AB



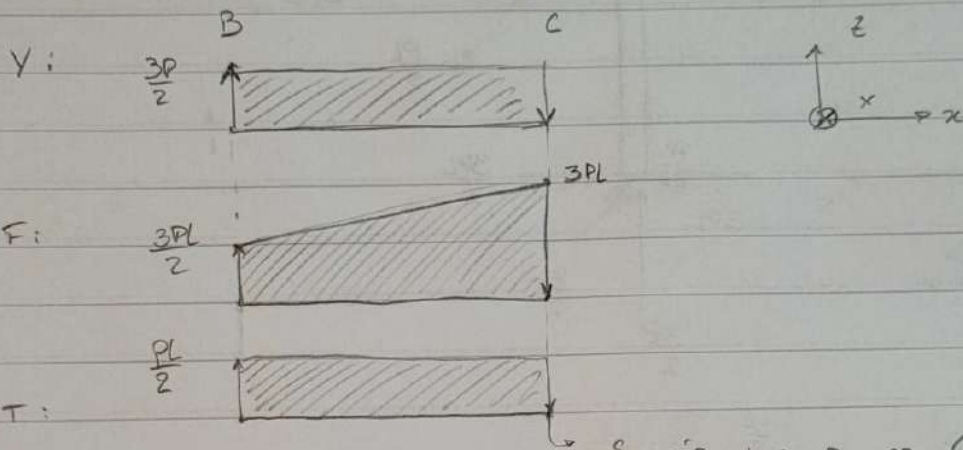
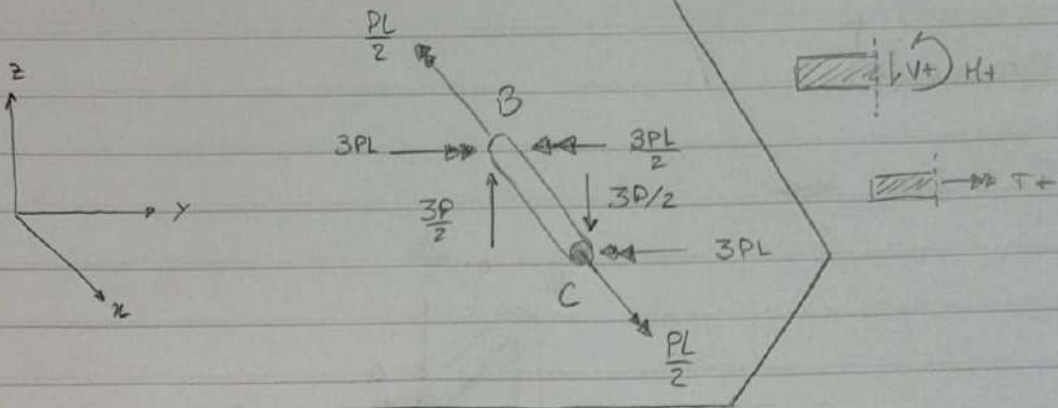
Como la sección es circular
 \rightarrow Flector máx. = $\sqrt{\left(\frac{PL}{2}\right)^2 + \left(\frac{3PL}{2}\right)^2}$
 $= 2,23 PL$



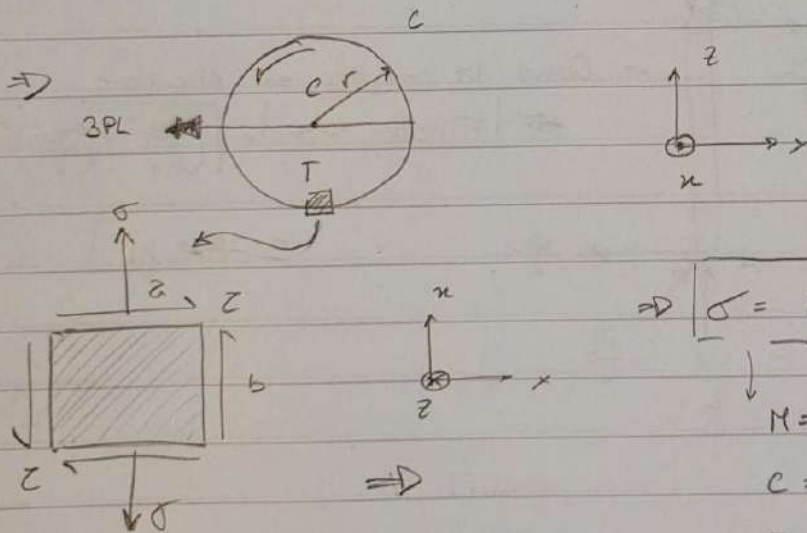
\rightarrow Todas las secciones igual de comprometidas en AB

DCL BC

Conversion:



Sección + comp. en C.



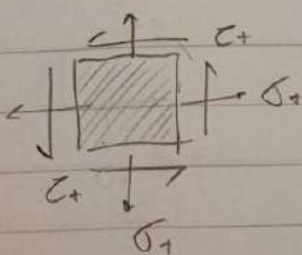
$$\Rightarrow \sigma = \frac{M \cdot c}{I} = 61,07 \text{ MPa}$$

$$M = 3PL = 750 \text{ Nm}$$

$$c = v = 0,025 \text{ m}$$

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

Conversion



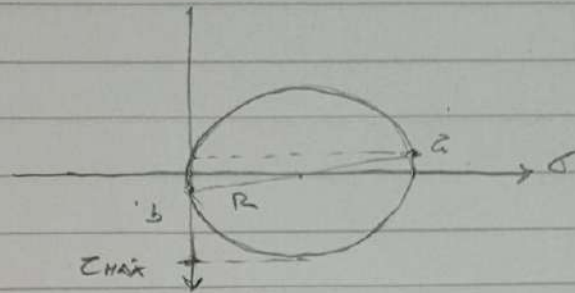
$$\tau = \frac{T \cdot r}{J} = 5,09 \text{ MPa}$$

$$T = PL/2 = 125 \text{ Nm}$$

$$r = 0,025 \text{ m}$$

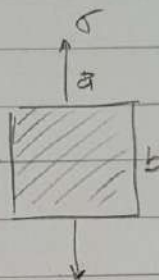
$$J = \frac{\pi r^4}{2} = 6,14 \times 10^{-7} \text{ m}^4$$

⇒



$$\Rightarrow z_{\text{Máx BC}} = R = \sqrt{\sigma^2 + c^2} = 61,28 \text{ MPa}$$

⇒ $z_{\text{Máx AB}}$ ⇒



$$\sigma = \frac{M_c}{I} + \frac{F}{A} = 96,15 \text{ MPa}$$

$\frac{45,9 \text{ MPa}}{I} + \frac{0,75 \text{ MPa}}{A}$

$$M = 2,23 PL = 557,5 \text{ Nm}$$

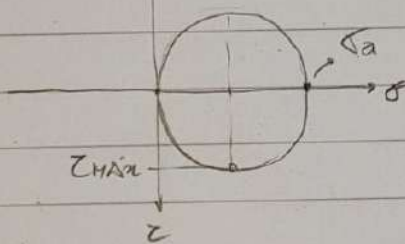
$$c = 0,025 \text{ m}$$

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

$$F = \frac{3P}{2} = 1500 \text{ N}$$

$$A = 0,002 \text{ m}$$

⇒



$$\Rightarrow z_{\text{Máx AB}} = \frac{\sqrt{z}}{2} = 23,08 \text{ MPa}$$

⇒ Tramo + comp. en BC, sección + comp. está en C.
punto + comp. indicado en diagramas.

$$c) \quad F_{S_{\text{Dx}}} = \frac{S_z}{2z_{\text{Máx}}} = \frac{250 \text{ MPa}}{2 \times 61,28 \text{ MPa}} \approx 2 \quad \checkmark$$

