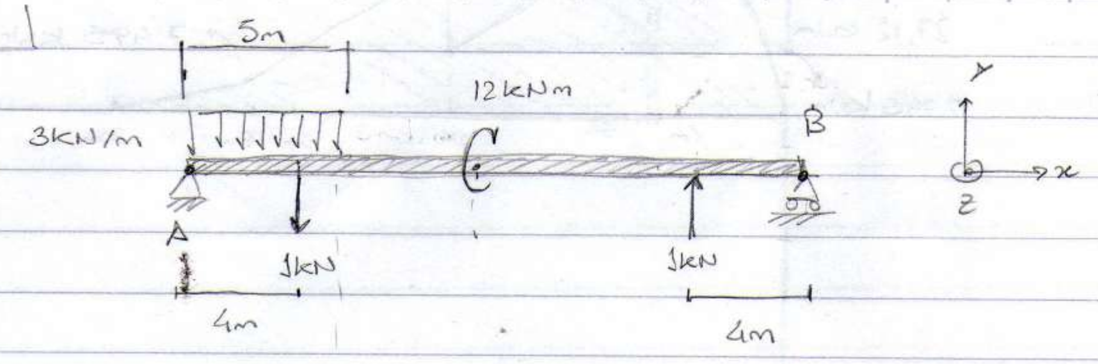
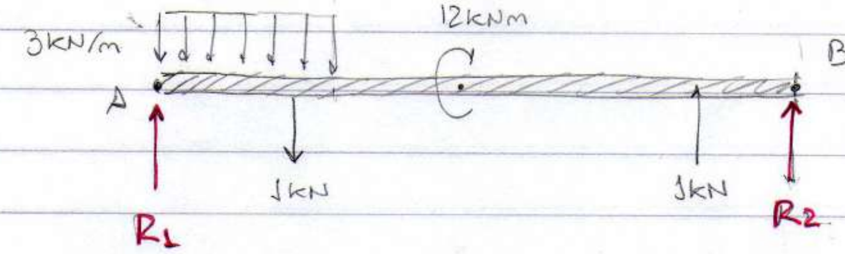
2° P 2021

Problema 1



⇒ DCL AB



$\Rightarrow \quad \Sigma F_y = 0 \iff R_1 + 1kN + R_2 = 1kN + 3\frac{kN}{\cancel{m}} \times 5\cancel{m}$

$$\iff \boxed{R_1 + R_2 = 15\,kN} \quad (1)$$

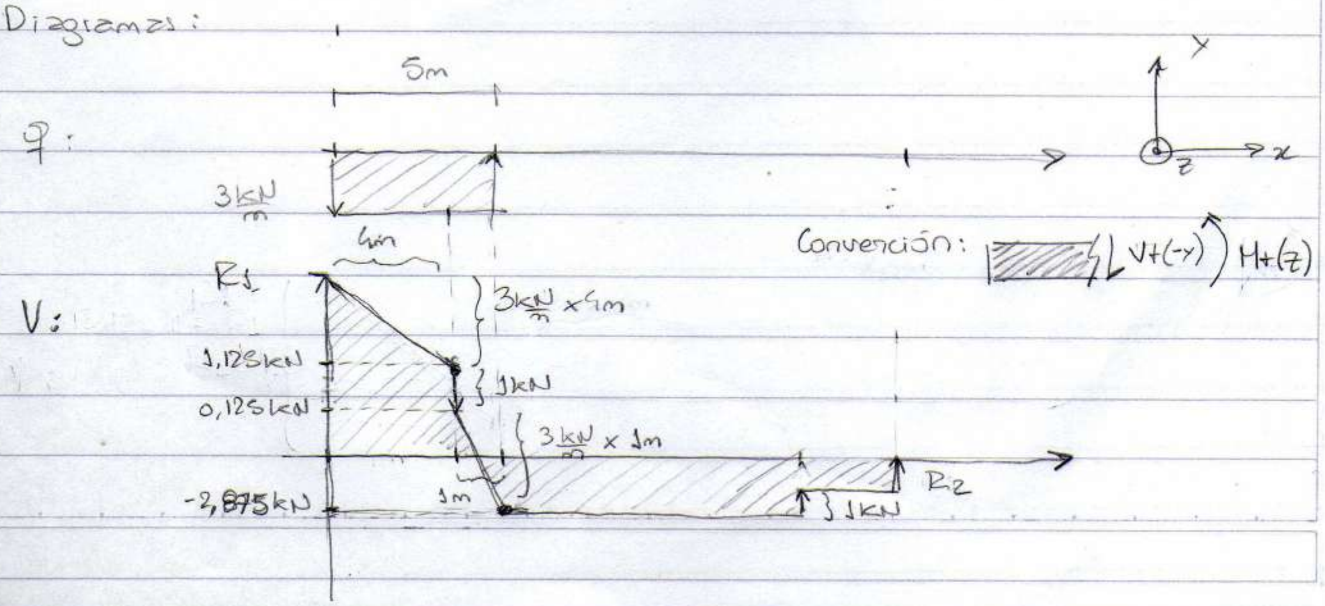
$\Rightarrow \quad \Sigma M_A = 0 \iff 3\frac{kN}{\cancel{m}} \times 5\cancel{m} \times 2{,}5m + 1kN \times 4m + 12\,kNm = 1kN \times 16m + R_2 \times 20m$

$\iff 37{,}5\,kNm + 4\,kNm + 12\,kNm = 16\,kNm + 20m \times R_2$

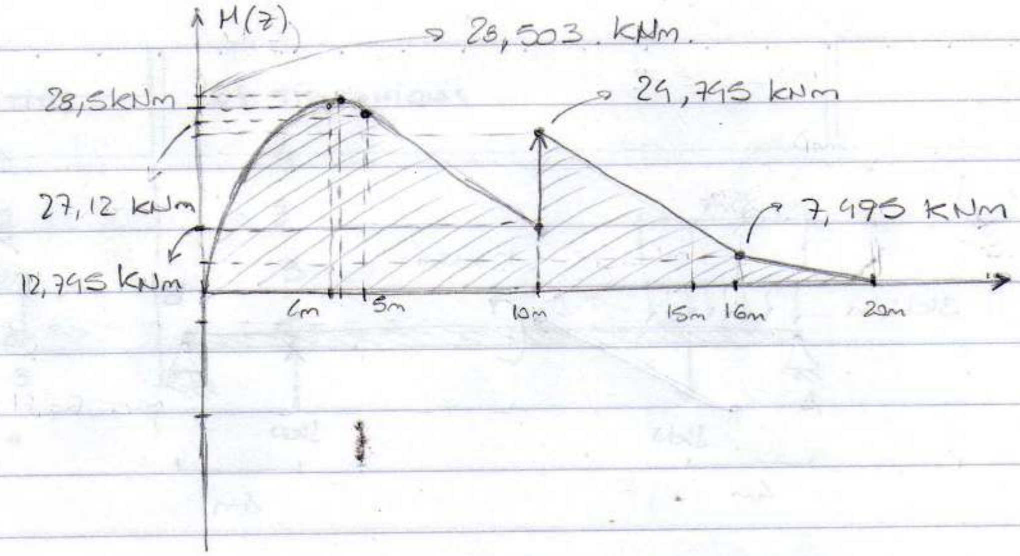
$37{,}5\,kN\cancel{m} = 20\cancel{m} \times R_2 \Rightarrow \boxed{R_2 = 1{,}875\,kN} \quad (2)$

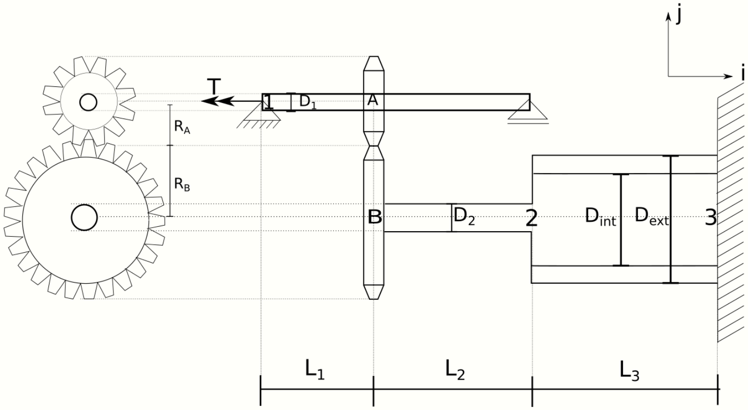
$\Rightarrow (1)\ y\ (2) \Rightarrow \boxed{R_1 = 13{,}125\,kN}$

Diagramas:

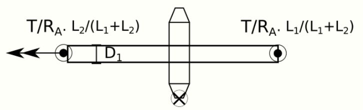


M :

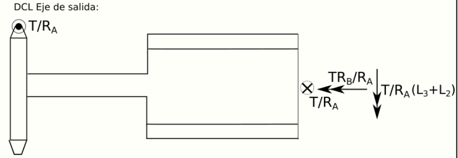

M(z)
28,503 . kNm.
28,5kNm
24,795 kNm
27,12 kNm
7,495 KNm
12,795 KNm
4m
5m
10m
15m
16m
20m



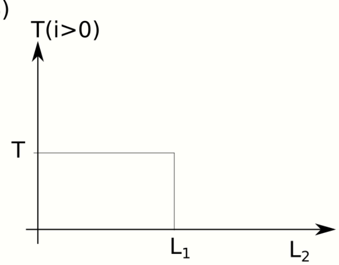
A) DCL Eje de entrada:

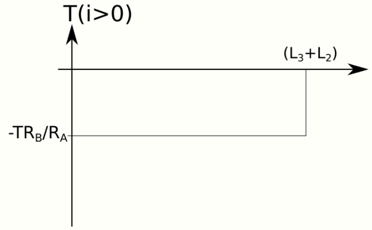


DCL Eje de salida:



B)

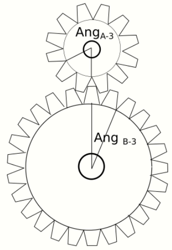




C) El ángulo se puede descomponer en dos terminos, el que se produce en el eje de entrada más el que se produce en el eje de salida. Esto es:

$$Ang_{1-3} \overset{1}{=} Ang_{A-3} + Ang_{1-A}$$

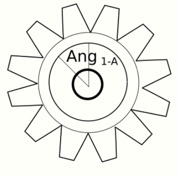
El angulo A-3 debe transofmrarse por la relación de giro:



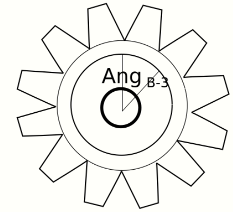
$$Ang_{A-3} \overset{2}{=} - Ang_{B-3}\, R_B/R_A$$

Del diagráma de torsor al eje de entrada se obtiene:

$$Ang_{1-A} = T \cdot L_1 / J_1\, G \text{ (anti horario)}$$



Del diagráma de torsor al eje de salida se obtiene:



$$Ang_{B-3} = Ang_{B-2} + Ang_{2-3}$$

$$Ang_{B-3} = \frac{32\ T.R_B.\ L_2}{R_A\ G\ (pi\ D_2\hat{}4)} + \frac{32\ T.R_B.\ L_3}{R_A\ G\ (pi\ (D_{ext}\hat{}4 - D_{int}\hat{}4\ )} \text{ (horario)}$$

Aplicando la relación de giro 2 se deduce:

$$Ang_{A-3} = \left(\frac{32\ T.R_B.\ L_2}{R_A\ G\ (pi\ D_2\hat{}4)} + \frac{32\ T.R_B.\ L_3}{R_A\ G\ (pi\ (D_{ext}\hat{}4 - D_{int}\hat{}4\ )} \right) R_B/R_A \text{ (Anti-horario)}$$

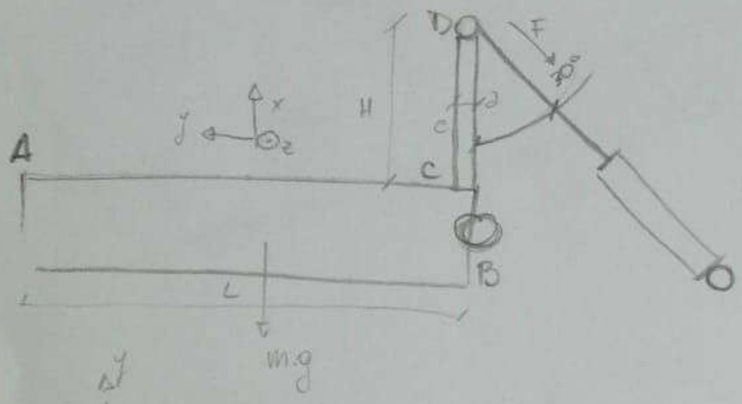
Sustituyendo la ecuación anterior en 1 se llega a:

$$Ang_{A-3} = \left(\frac{32\ T.R_B.\ L_2}{R_A\ G\ (pi\ D_2\hat{}4)} + \frac{32\ T.R_B.\ L_3}{R_A\ G\ (pi\ (D_{ext}\hat{}4 - D_{int}\hat{}4\ )} \right) R_B/R_A + \frac{32\ T\ L_1}{G\ (pi\ D_1\hat{}4)} \text{ (Anti-horario)}$$

$Ang_{A-3} =$ 12.2 º

2^{do} Parcial TIM52 2021

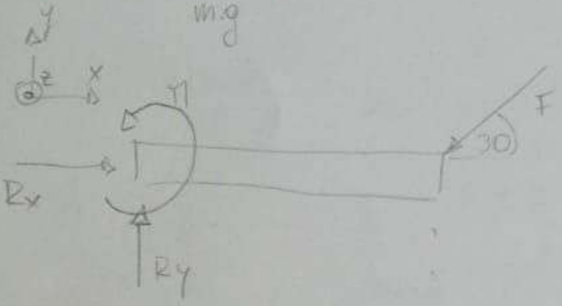
Problema 3:



$$\Sigma M_B = 0 \to mg.\frac{L}{2} = H.F\,sen(30)$$

$$F = \frac{mgL}{2H\,sen(30)} = 20.580\ N$$

a)

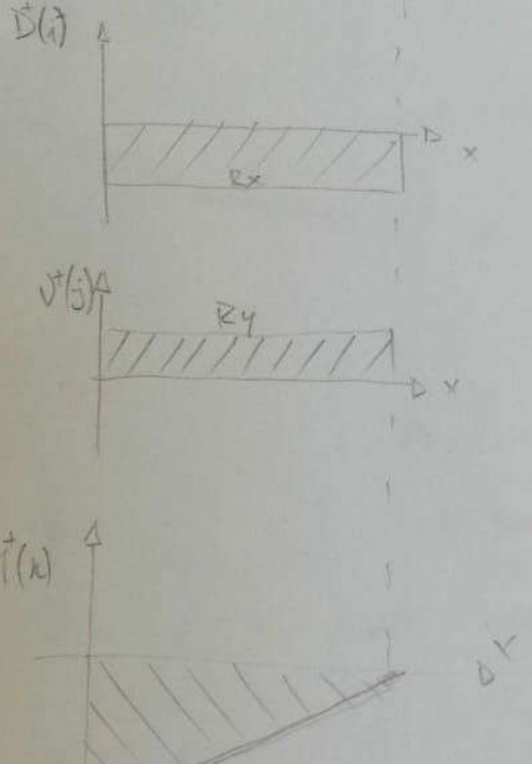


$\to$ $R_x = F\cos(30) = 17.823\ N$

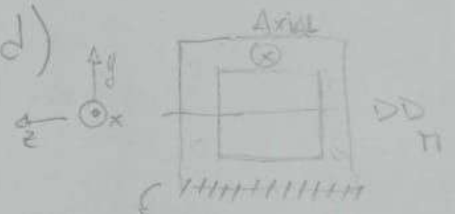
$R_y = F\,sen(30) = 10.290\ N$

$M = F\,sen(30).H = 5.145\ Nm$

b)



d)



Puntos más comprometidos: compresión del flector + compresión axial.

e) $\sigma_{AXIAL} = \frac{R_x}{A} = 21,8\ MPa$

$A = a^2 - (a-2e)^2 = 8.16\times10^{-4}\ m^2$

$\sigma_f = \frac{M\,a}{2I} = 643,7\ MPa$

$I = \frac{a^4}{12} - \frac{(a-2e)^4}{12} = 1,6\times10^{-7}\ m^4$

c) A Sección más comprometida es (C)

$\tau_{max} = \frac{\sigma_1}{2} = (\sigma_a + \sigma_f)/2 = 333,4\ MPa$

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