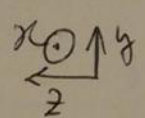
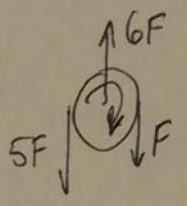
TIM 52 - SEGUNDO PARCIAL 2018

EJ 1:

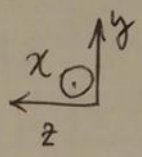
DCL P1:

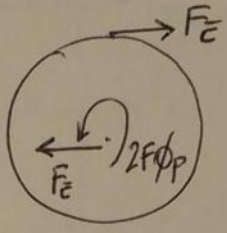




el par vale: $2F.\phi_p$ (diámetro polea)

DCL E2

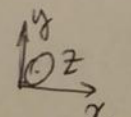


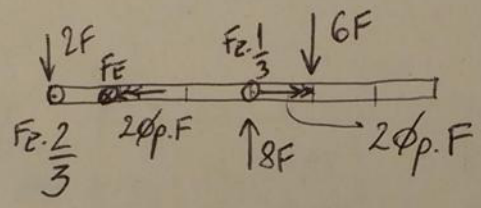


$$F_E = 4.F.\frac{\phi_p}{\phi_{E2}} = \frac{8}{3}$$

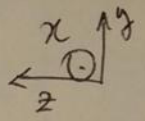
(ϕ_p: diámetro polea; ϕ_{E2}: diámetro del engranaje 2)

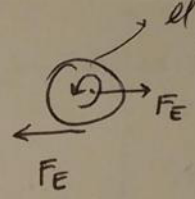
DCL (b)



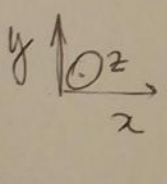


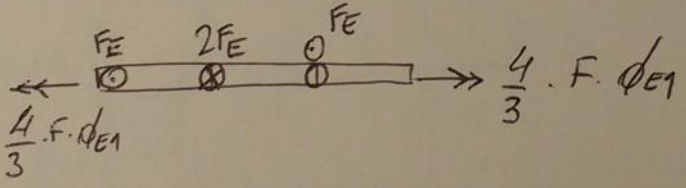
DCL E1





DCL (a)



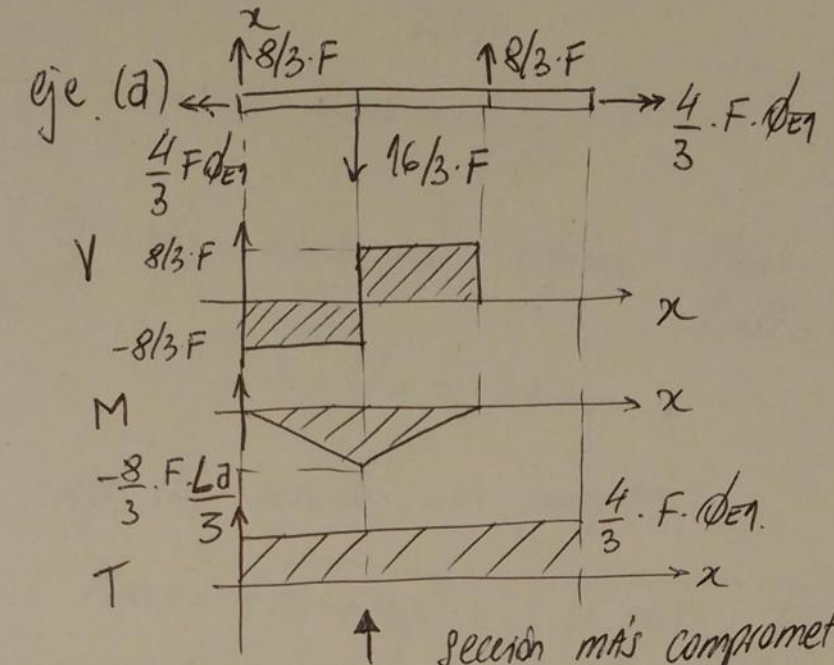


b) $P = T.\omega = T.\frac{2\pi.n}{60} \rightarrow T = \frac{P.60}{2\pi n} = 127\ N.m$

$T = \frac{4}{3}.F.\phi_{E1} \rightarrow F = 636\ N$

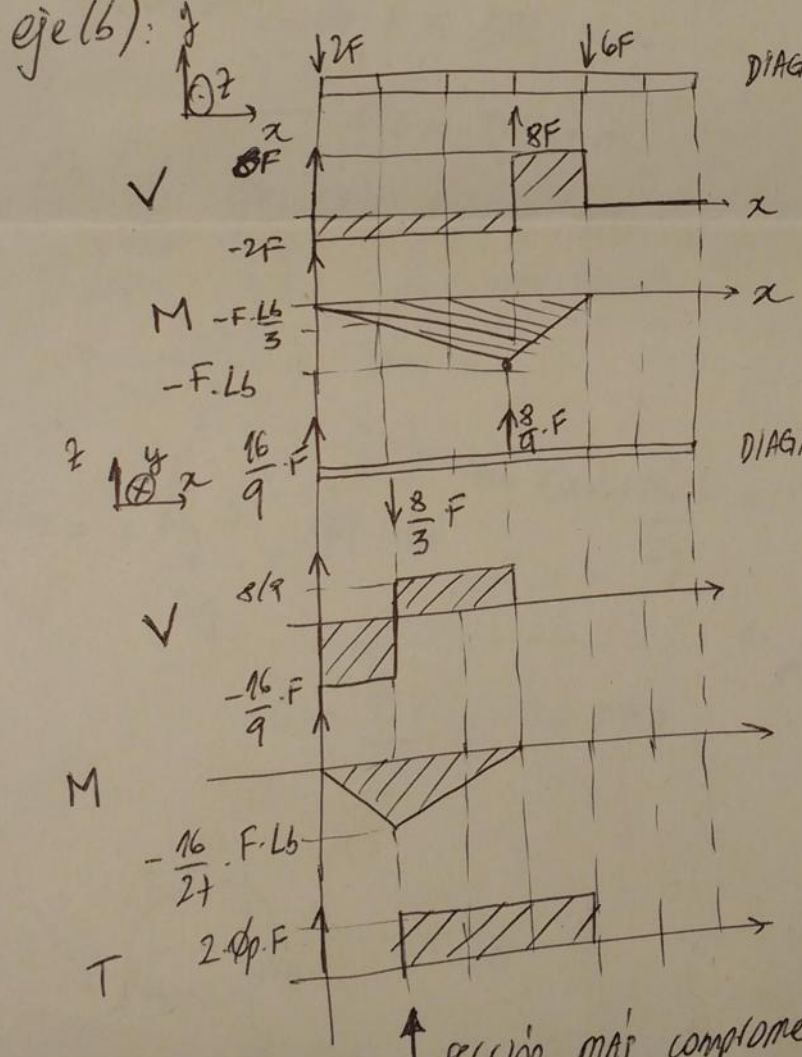
c) z ↑ ⊗ y →

eje (a)



↑ sección más comprometida en (a): $x = 1/3 \cdot La$

eje (b):



$M(x = 1/6 \cdot Lb) = -\frac{FLb}{3}$

↑ sección más comprometida en (b): $x = 1/6 \cdot Lb$

)

TRESCA: $\tau_{max} = \frac{S_y}{2 \cdot FD}$

FLEXOTORSIÓN: $\tau_{max} = \frac{16}{\pi \cdot \phi^3} \cdot \sqrt{M^2 + T^2}$

$$\Big\} \quad \phi^3 = \frac{16 \cdot 2 \cdot FD}{\pi \cdot S_y} \cdot \sqrt{M^2 + T^2}$$

Eje (a): sección más comprom: $M_{max} = 226\ N.m$

$T_{máx} = 127\ N.m$

$\longrightarrow \phi_a = 29\ mm$

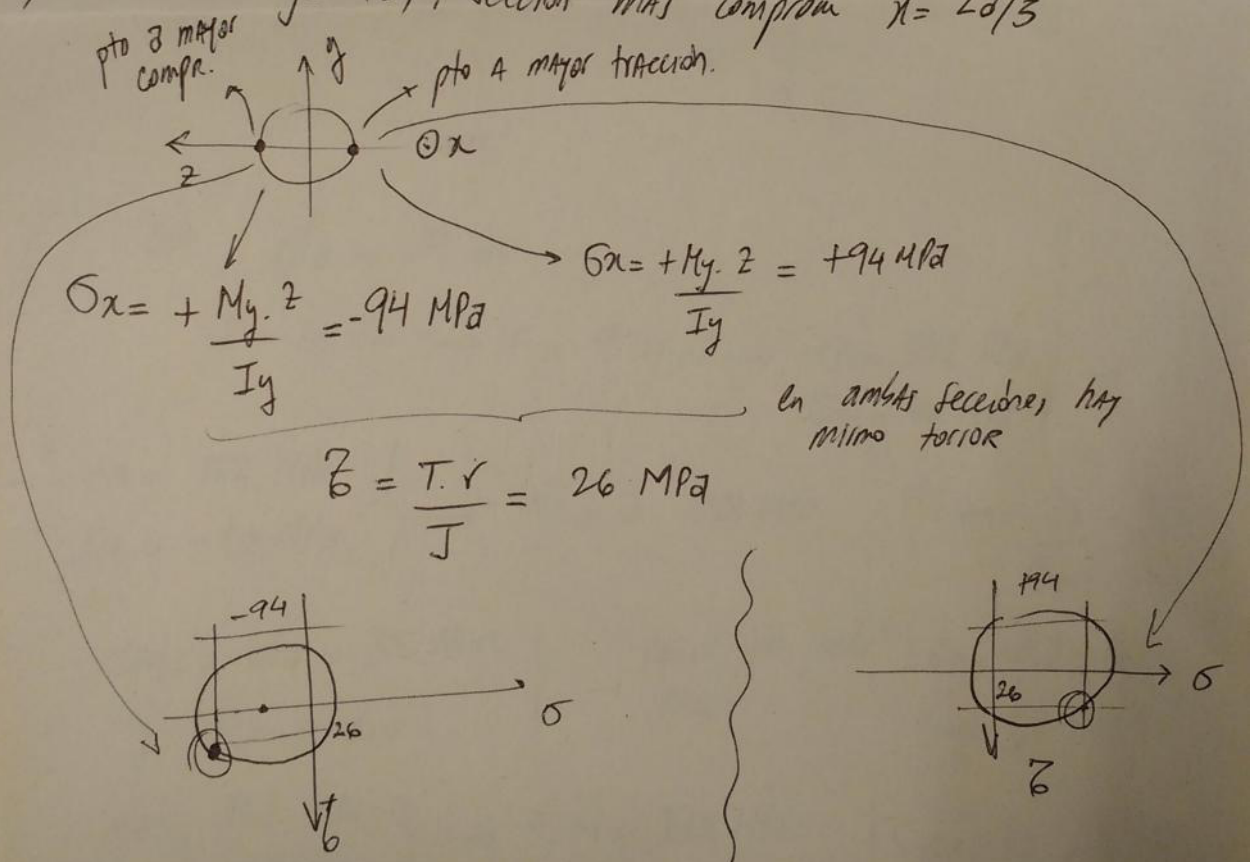
eje (b): sección más comprom:

$$M_{max} = \sqrt{M_z^2 + M_y^2} = \sqrt{\left(\frac{F \cdot Lb}{3}\right)^2 + \left(\frac{16}{27} \cdot F \cdot Lb\right)^2} = 260\ N.m$$

$T_{máx} = 2 \cdot \phi_p \cdot F = 382\ N.m$

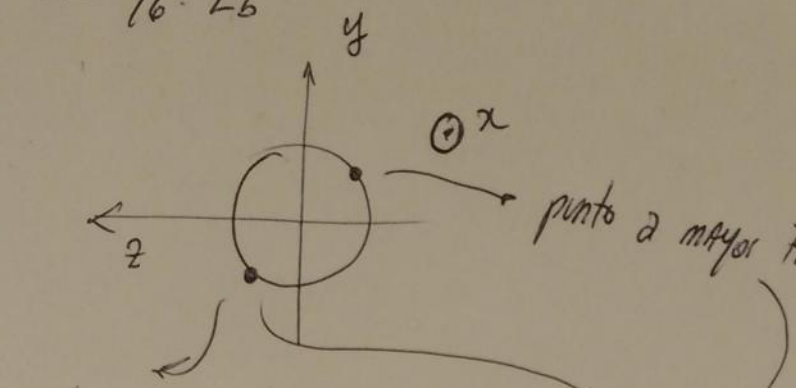
$\longrightarrow \phi_b = 35\ mm$

d) En el eje (a); sección más comprom $x = La/3$



d) en el eje (b), sección más comprometida

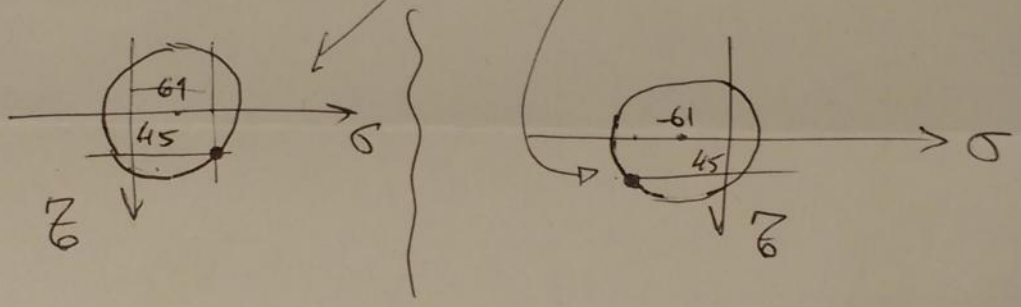
$x = 1/6 \cdot Lb$



$\sigma t = 26$

$\sigma x = \pm 61$ MPa

$\tau xy = + 45$ MPa



f) con $\phi a = 29$ mm

$P = 30$ kW $\rightarrow F = 954$ N $\rightarrow$ $\sigma x = 142$ MPa, $\tau xy = 40$ MPa $\rightarrow$

$\rightarrow \sigma 1 = 152$ MPa, $\sigma 2 = -10$ MPa $\rightarrow \sigma_{VM} = 158$ MPa $\quad FS_{VM} = \frac{Sy}{\sigma_{VM}} = 1,2$

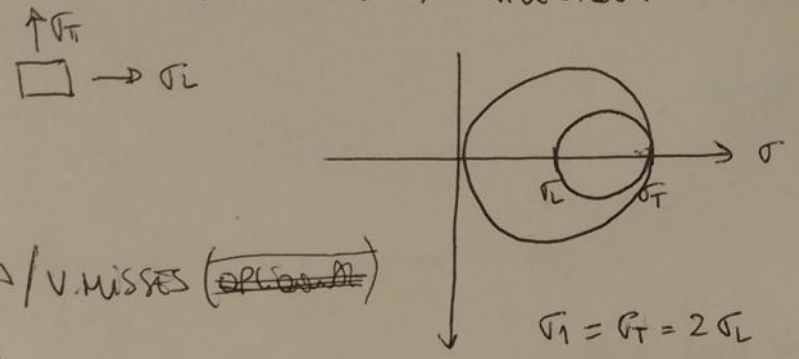
con $\phi b = 35$ mm y $P = 30$ kW $\rightarrow$ en el pto más compr. $\sigma x = 92$ MPa, $\tau xy = 67$ MPa $\rightarrow$

$\sigma 1 = 127$ MPa, $\sigma 2 = -36$ MPa $\rightarrow \sigma_{VM} = 148$ MPa $\quad FS_{VM} = \frac{Sy}{\sigma_{VM}} = 1,28$

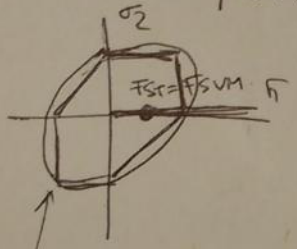
EJERCICIO 2 — 2º PARCIAL, JUNIO 2018

TIM52 / MD3 / COM. P. MEC. DE MAT

ESTADO TENSIONAL REAL A PRESIÓN.



TRESCA / V. MISSES (~~OPCIONAL~~)



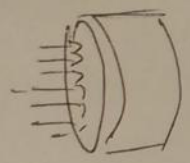
$\sigma_1 = \sigma_T = 2\sigma_L$

$\sigma_2 = \sigma_L$

$\sigma_3 = 0$

$$F_S = 1{,}75 = \frac{S_y}{\sigma_1} \rightarrow \sigma_1 = \frac{S_y}{1{,}75}$$

$$2\sigma_L = \frac{S_y}{1{,}75} \rightarrow \sigma_L = \frac{S_y}{2 \cdot 1{,}75}$$



$$\frac{P \cdot \pi \phi^2}{4} = \sigma_L \cdot \pi \phi t \rightarrow \sigma_L = \frac{P\phi}{4t}$$

$$\frac{P\phi}{4t} = \frac{S_y}{2 \cdot 1{,}75} \rightarrow \phi = \frac{2 S_y \cdot t}{P \cdot 1{,}75} = 2{,}46\ m.$$

VOL RECIPIENTE: $\frac{4\pi}{3}\left(\frac{\phi}{2}\right)^3 + \frac{\pi \phi^2}{4} L = 20\ m^3$

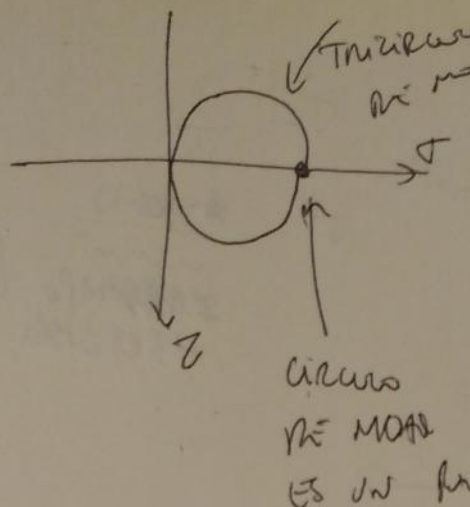
$$\frac{4\pi\phi^3}{24} + \frac{\pi\phi^2 L}{4} = 20\ m^3.$$

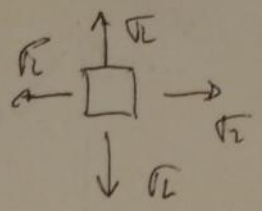
$$\rightarrow L = \left(20\ m^3 - 9{,}99\ m^3\right) \frac{4}{\pi \phi^2}$$

$$L = 20{,}56\ m$$

b) Como $\sigma_2 = 0$ la línea de carga se mueve sobre el recto σ_1 entonces como los criterios coinciden $F_{SVM} = F_{ST}$.

c)



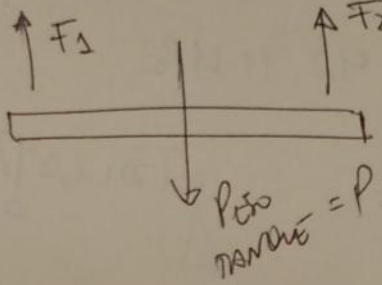


$\sigma_1 = \sigma_2 = \sigma_2$

$\sigma_3 = 0$

"SOPORTES"

a)



$P = L \cdot \pi \phi \cdot t \cdot 8000$

$P = 1899\ kg \cdot 9{,}8\ m/s^2$

$P = 18613{,}3\ N$

$\sum M_{centro\ (viga/2)} = 0 \rightarrow F_1 = F_2$

$\rightarrow F_2 = P/2 = 9306{,}65\ N = F_1$

b) COLUMNA (COMPROBAR F_2)

$\lambda_{cr} = \sqrt{\frac{200 kg/cm^2}{2000 kg/cm^2}} \cdot \pi = 99{,}3$

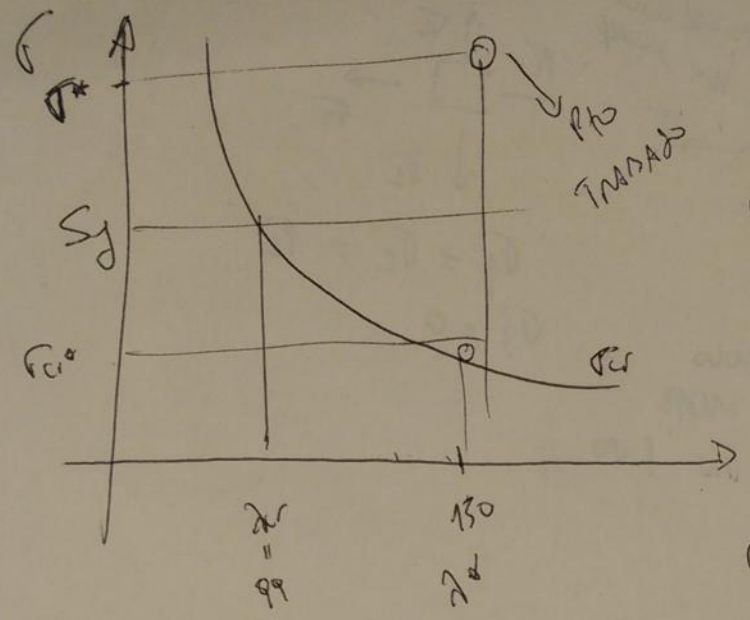
$\lambda' = \frac{L_{eq}}{\rho}$

$\rho = \sqrt{\frac{I}{A}} = 0{,}01166$

$L_{eq} = L \cdot 0{,}7 = 1{,}75$

$\rightarrow \lambda' = 150$

$\lambda' > \lambda_{cr} \rightarrow$ ESTUDIO PANDEO



$\sigma = \frac{P}{A}$

$\sigma^* = \frac{930,6\ N}{0,01\ m^2} = 930,6\ MPa$ ||

σ_{cr} (NO ES NECESARIO HACERLO)

$\sigma_{cr}^* = \frac{\pi^2 E}{\lambda^{*2}} = 92,11\ MPa$ $\quad \frac{\sigma_{cr}^*}{\sigma^*} < 1$

FALLA

c) se puede acortar el alto de la viga sin embargo habría que mejorar el área de la sección para que σ^* |