Cargas que actuan sobre el eje:

Peso del rotor -> W_r
Peso de la Polea -> W_p
Torque Polea -> T_p
Torque Cuchilla -> T_c
Fuerza lado tenso -> F_1
Fuerza lado flojo -> F_2

$W_r = 73,43\,[Kg] \times 9,81\left[\frac{m}{s^2}\right]$

$\boxed{W_r = 737,75\,[N]}$

$W_p = 0,6\,[Kg] \times 9,81\left[\frac{m}{s^2}\right]$

$\boxed{W_p = 5,89\,[N]}$

Torque Polea:

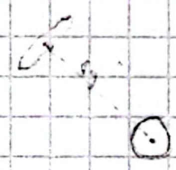
$T_p = \frac{Pot}{\omega}$

$T_p = \frac{3778,5\,[W]}{788,5\left[\frac{rad}{s}\right]}$

$\boxed{T_p = 79,78\,[N.m]}$

$\boxed{T_p = T_c}$

Fuerza de la Cuchilla



$r_g =$ [illegible] $[m]$

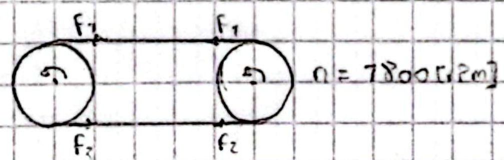
$T_c = F_c \times r_g$

$F_c = \frac{T_c}{r_g}$

$F_c = \frac{79,78\,[N.m]}{0,0?95\,[m]}$

$\boxed{F_c = 270,42\,[N]}$

Tensiones de las Correas



$F_1 - F_2 = \frac{2T}{D}$

$F_1 - F_2 = \frac{2 \times 79,78}{0,7076}$

$F_1 - F_2 = 389,37\,[N]$ --- (1)

$F_1 = F_2 \cdot e^{\mu_s \cdot \beta}$

$\mu_s = 0,5128$
$\beta = \pi$

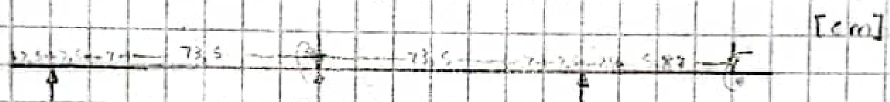
$F_1 = 5 \cdot F_2$ ... (2)

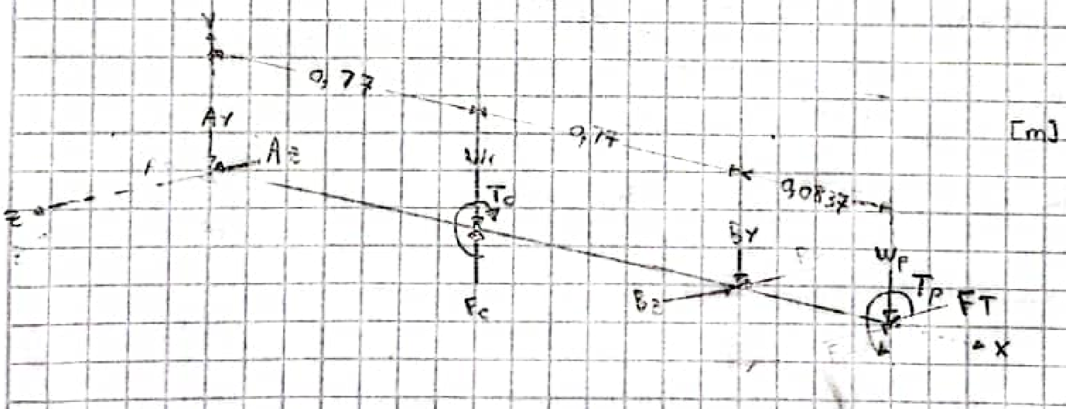
reemplazo en (1)

$5F_2 - F_2 = 389,37$ [N]

$\boxed{F_2 = 97,34 \text{ [N]}}$

$\boxed{F_1 = 486,73 \text{ [N]}}$





↑(+)
$\Sigma F_y = 0$

$-A_y + F_c - W_1 - B_y - W_p = 0$

$-A_y + 270,42 - 191,75 - B_y - 5,89 = 0$

$A_y + B_y = 72,78$ [N]

$\boxed{A_y = 40,78 \text{ [N]}}$

$\Sigma M_z = 0$

$W_c \times 0,77 - F_c \cdot 0,77 + B_y \times 0,34 + W_p \times 0,4237 = 0$

$$B_y = \frac{-W_c \cdot 0,77 + F_c \cdot 0,77 - W_p \cdot 0,4237}{0,34}$$

$$B_y = \frac{-737,75 \times (0,77) + 270,48(0,77) - 5,89 \times (0,4237)}{0,34}$$

$\boxed{B_y = 332\,[N]}$

(+) $\Sigma F_z = 0$

$-A_z - B_z + F_T = 0$

$B_z - A_z = 584,04\,[N]$

$\boxed{A_z = 743,78\,[N]}$

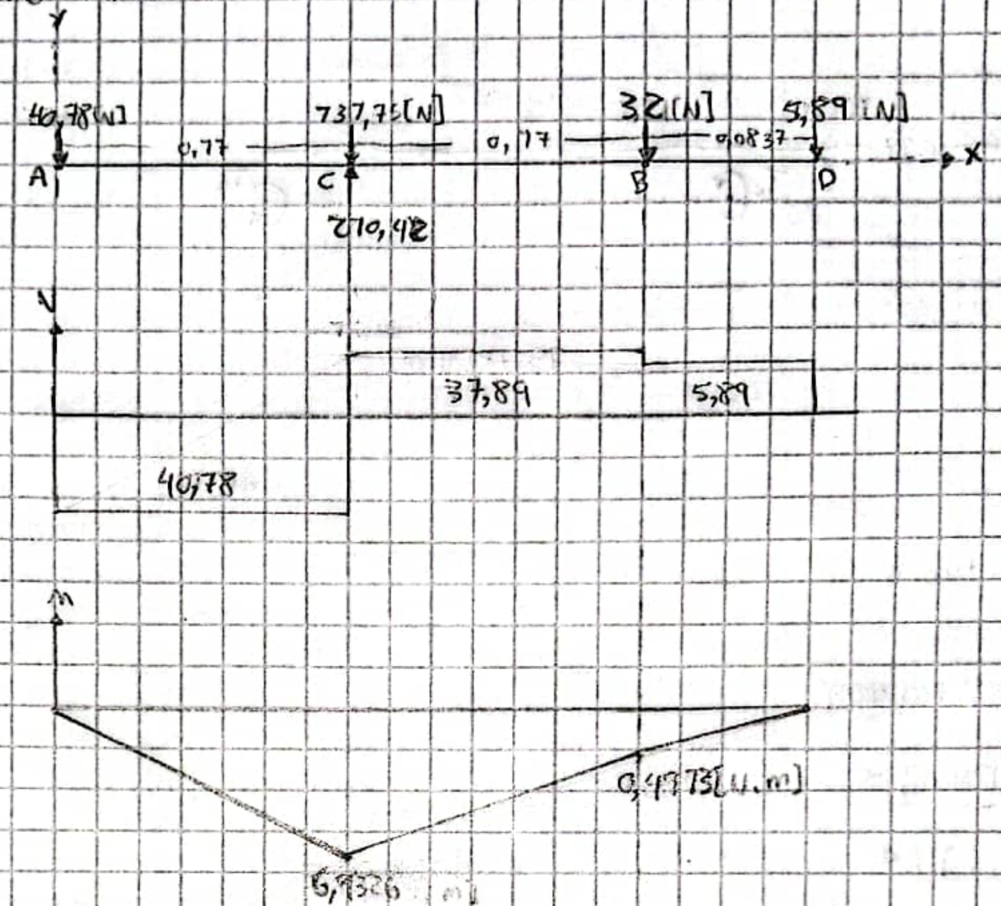
ΣM_y

$-B_z \times 0,34 + F_T \cdot 0,4237 = 0$

$$B_z = \frac{584,04 \times 0,4237}{0,34}$$

$\boxed{B_z = 727,82\,[N]}$

Plano x-Y



Plano X-Z

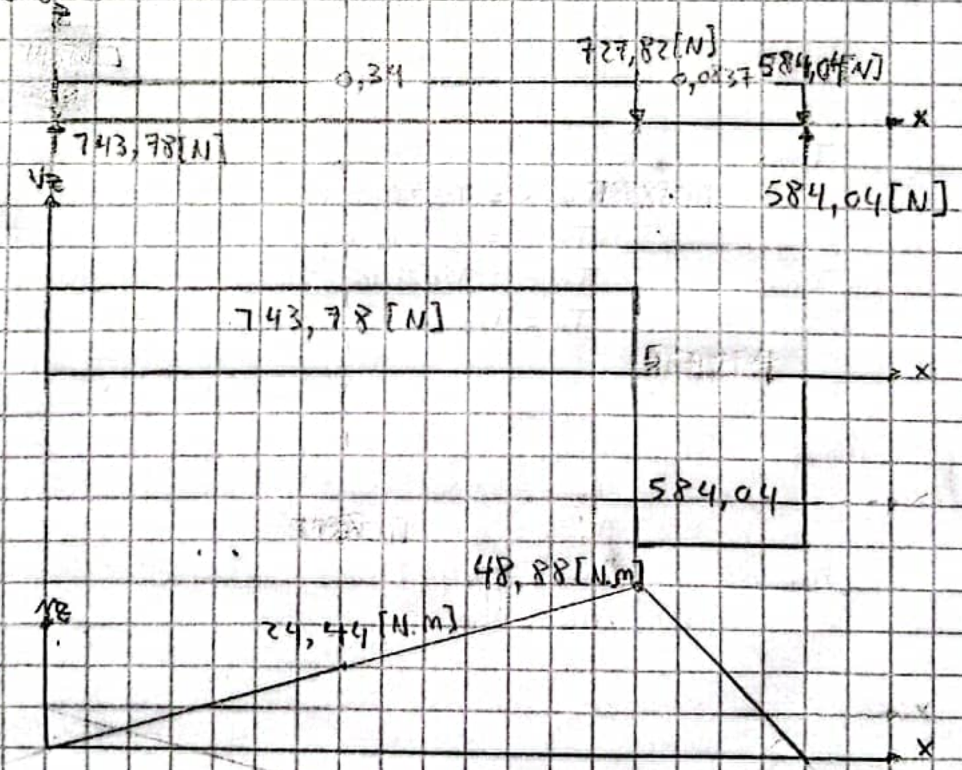
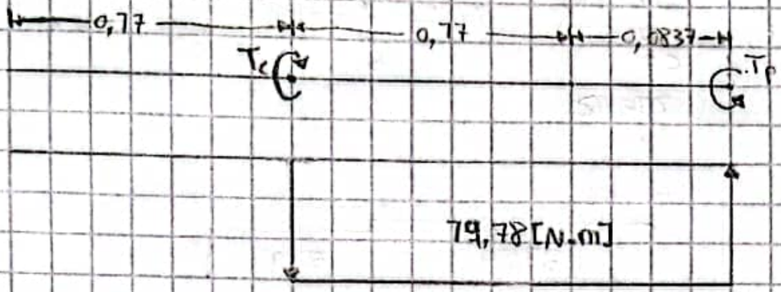


Diagrama de torsión

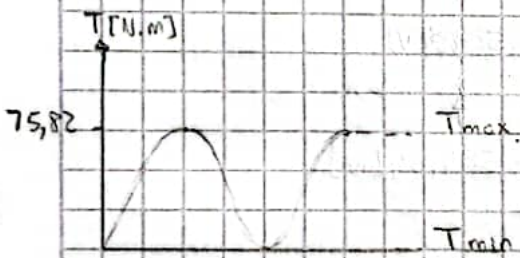


Seccion Critica B

$M_{RB} = \sqrt{(48,88)^2 + (0,4973)^2}$

$\boxed{M_{RB} = 48,88\,[N.m]}$

$\boxed{T_B = 79,78\,[N.m]}$

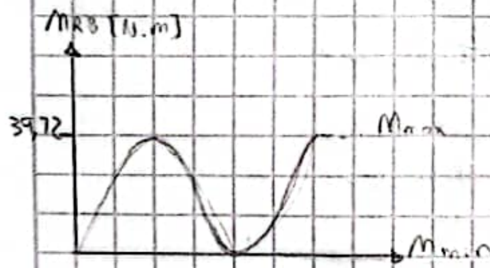


$\rightarrow T_{max} = 79,78\,[N.m]$

$T_{min} = 0\,[N.m]$

$T_m = 9,89\,[N.m]$

$T_a = T_m$



$\rightarrow M_{max} = 48,88\,[N.m]$

$M_{min} = 0\,[N.m]$

$M_m = 24,44\,[N.m]$

$M_a = M_m$

T

Para el acero AISI 4340:

$S_y = 710\,[MPa]$

$S_y = 710 \times 10^6\,[Pa]$

$S_{ut} = 1110\,[MPa]$

$S_{ut} = 1110 \times 10^6\,[Pa]$

Factores modificadores:

$S_e' = 0,5 \cdot S_{ut}$

$\boxed{S_e' = 555\,[MPa]}$

$S_e = K_a \cdot K_b \cdot K_c \cdot K_d \cdot K_e \cdot S_e'$

$K_a = a \cdot S_{ut}^{\,b}$

Cap 6 Pág 330 → Shigley

$a = 4,51$

$b = -0,265$

$K_a = 4,51 \times (1110)^{-0,265}$

$\boxed{K_a = 0,703}$

$K_b = 1,24\, d^{-0,107}$ → Se asume $d = 25\,[mm]$

$K_b = 1,24 \times (25)^{-0,107}$

$\boxed{K_b = 0,877}$

$\boxed{K_c = 1}$

$\boxed{K_d = 1}$

$\boxed{K_e = 0,702}$ → confiabilidad del 99,99%

$K_f = 2$ } Chaveteros con extremos fresados
$K_t = 1,6$

$S_e = 0,703 \times 0,877 \times 1 \times 1 \times 0,702 \times (555)$

$S_e = 240,21\,[MPa]$

ED-Soderberg

$$d = \left(\frac{16 \cdot n}{\pi} \cdot \left\{ \frac{1}{S_e} \cdot \left[4 \cdot (K_f \cdot M_a)^2 + 3 \cdot (K_{fs} \cdot T_a)^2 \right]^{1/2} + \frac{1}{S_y} \cdot \left[4 \cdot (K_f \cdot M_m)^2 + 3 \cdot (K_{fs} \cdot T_m)^2 \right]^{1/2} \right\} \right)^{1/3}$$

para un factor de seguridad: $n = 3$

$d = 0{,}02056\ [m] = 20{,}56\ [mm]$

Se toma:

$d = 25{,}4\ [mm]$