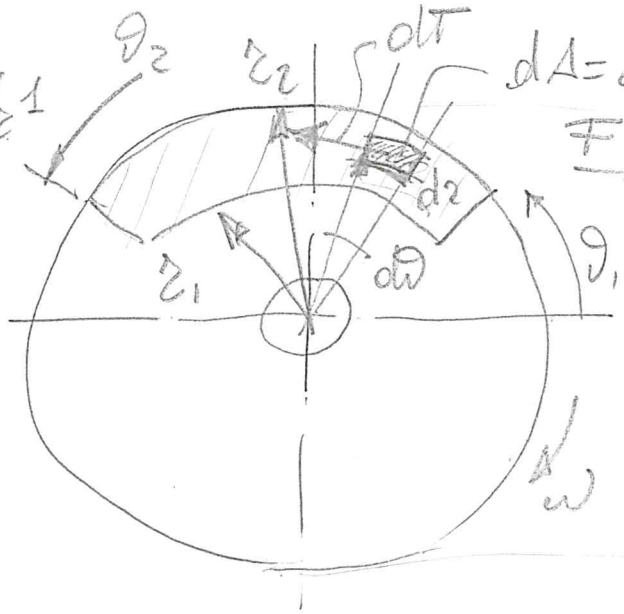
$$\delta V = \delta dA = K f P dA V_r 1$$

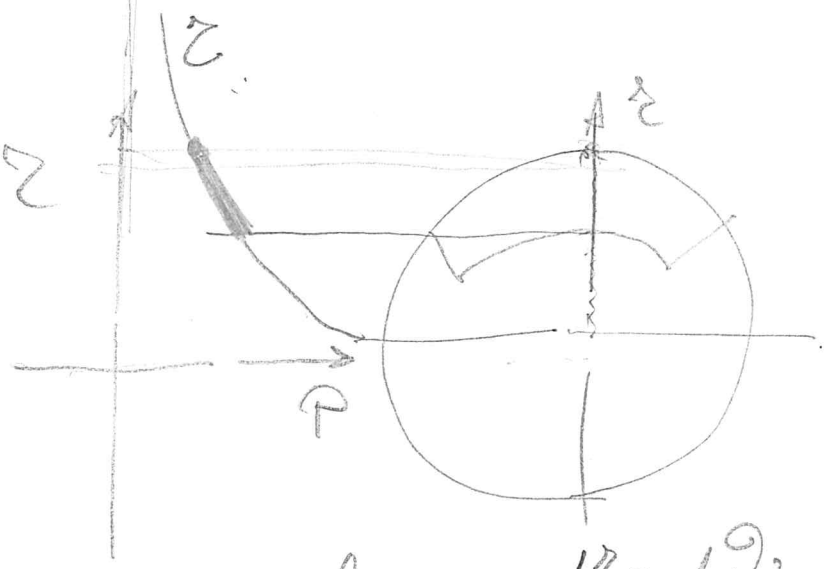
$$\delta = \cos\tau$$

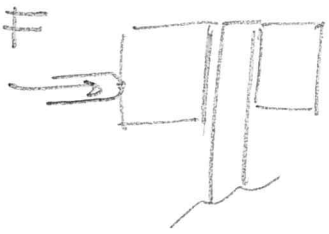
$$V_r = \omega r$$

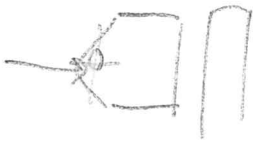
$$\delta = K f P \omega r$$



$$P = \frac{K}{r}$$







$$F = N = \int_A P dA = \int_{r_1}^{r_2} \int_{\vartheta_1}^{\vartheta_2} \frac{K}{r} r dr d\vartheta = K(r_2 - r_1)(\vartheta_2 - \vartheta_1)$$

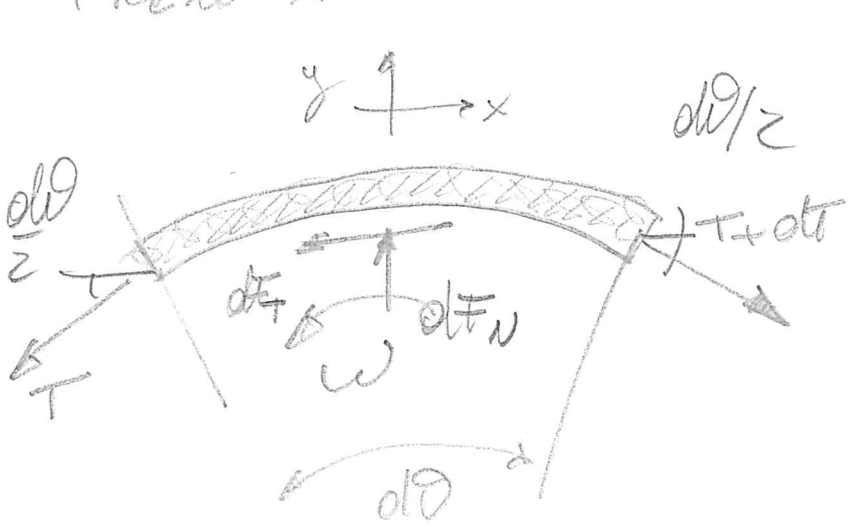
$$M = \int_A r f P dA = \int_{r_1}^{r_2} \int_{\vartheta_1}^{\vartheta_2} f \frac{K}{r} r \, r dr d\vartheta =$$

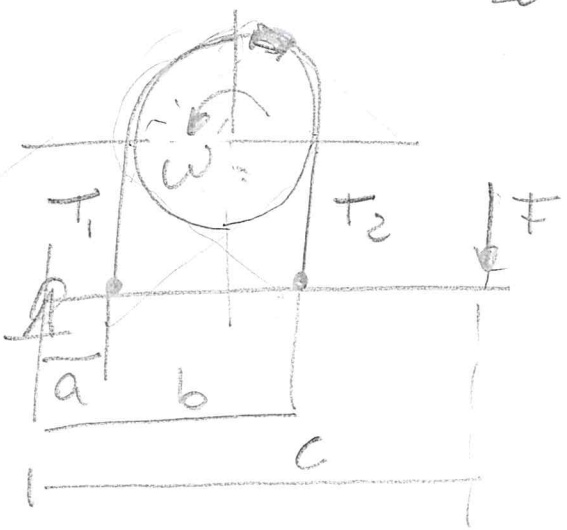
$$= f K \int_{r_1}^{r_2} \int_{\vartheta_1}^{\vartheta_2} r dr d\vartheta = f K(\vartheta_2 - \vartheta_1) \frac{r_2^2 - r_1^2}{2} =$$

$$= f \underbrace{K(\vartheta_2 - \vartheta_1)(r_2 - r_1)}_{F} \frac{r_2 + r_1}{2} = f F \frac{r_1 + r_2}{2}$$

$$M = f F \frac{r_1 + r_2}{2}$$

FRENO A NASTRO





$$\begin{cases} (T+dT)\cos\frac{d\vartheta}{2} - T\cos\frac{d\vartheta}{2} - dF_T = 0 \\ dF_N - T\sin\frac{d\vartheta}{2} - (T+dT)\sin\frac{d\vartheta}{2} = 0 \\ dF_T = f\,dF_N \end{cases}$$

$$\frac{d\vartheta}{2} \to 0 \qquad \cos\frac{d\vartheta}{2} \to 1 \qquad \sin\frac{d\vartheta}{2} \to \frac{d\vartheta}{2}$$

$$\begin{cases} T + dT - T - dF_T \cong 0 \\ dF_N - T\frac{d\vartheta}{2} - T\frac{d\vartheta}{2} - dT\frac{d\vartheta}{2} \cong 0 \\ dF_T = f\,dF_N \end{cases} \qquad dT \cong dF_T$$

$$\begin{cases} dF_T \cong dT \\ dF_N - T\,d\vartheta \cong 0 \\ dF_T = f\,dF_N \end{cases}$$

$$f\,dF_N \cong dT$$
$$dF_N \cong T\,d\vartheta$$

$$f\,T\,d\vartheta \cong dT$$

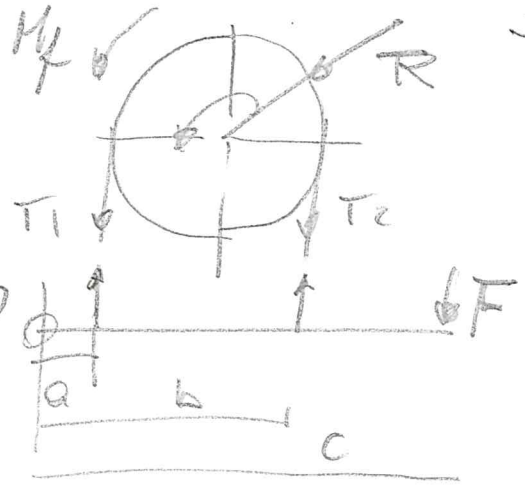
$$\frac{dT}{T} \cong f\,d\vartheta$$

$$\int_{T_1}^{T_2}\frac{dT}{T} \cong \int_{\vartheta_1}^{\vartheta_2} f\,d\vartheta$$

$$\ln\frac{T_2}{T} \cong f(\vartheta_2 - \vartheta_1)$$
$$\vartheta^*$$

$$\frac{T_2}{T_1} \cong e^{f\vartheta^*}$$

$$M_f = (T_2 - T_1) R$$



- $F_C - T_2 b - T_1 a = 0$

$$\frac{T_2}{T_1} = e^{f\vartheta}$$

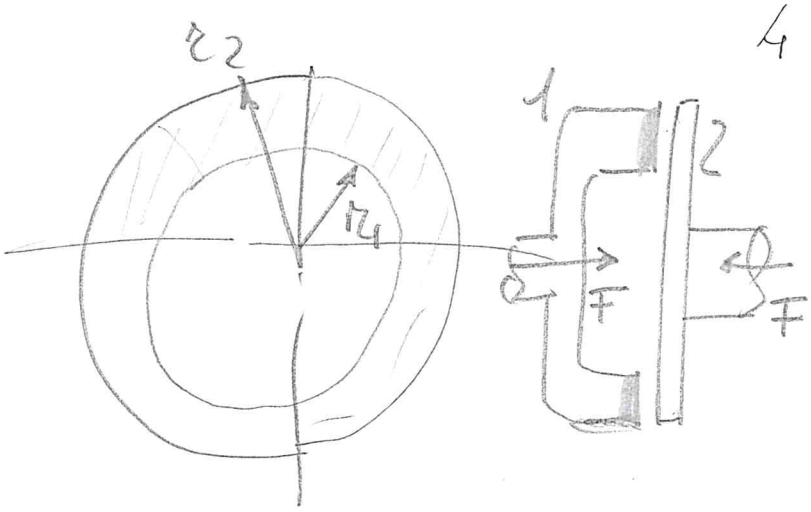
- $M_f = (T_2 - T_1) R = T_1 R \left(e^{f\vartheta} - 1\right)$

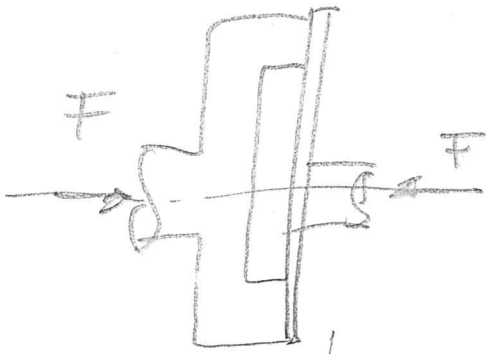
FRIZIONE PIANA

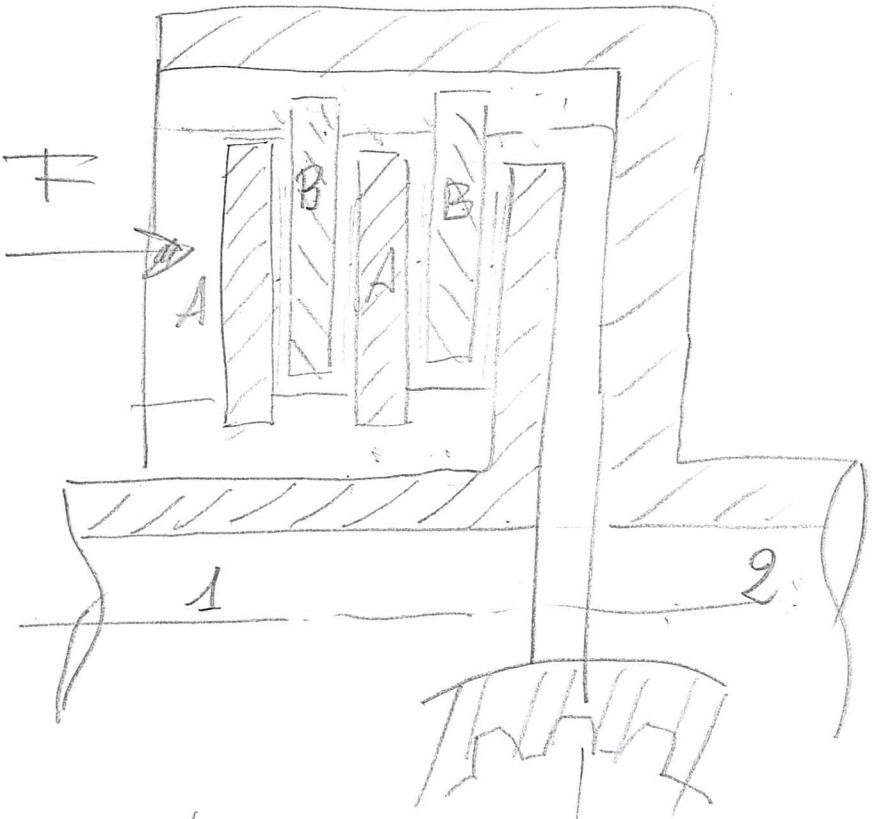
$$M = f F \frac{r_1 + r_2}{2}$$

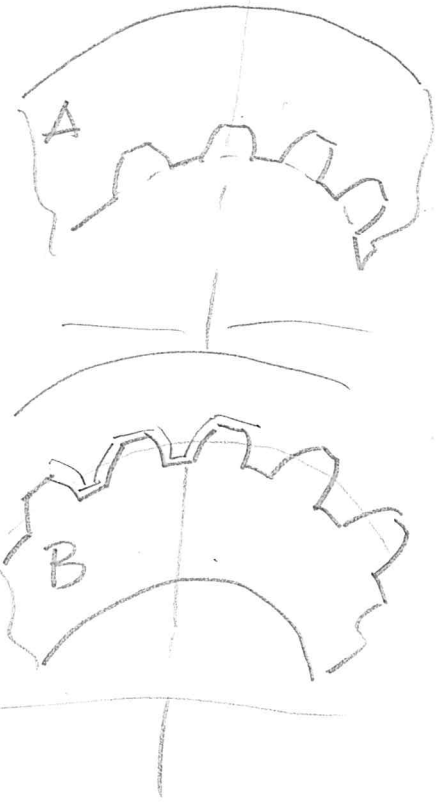
$$M = f_a F \frac{r_1 + r_2}{2}$$

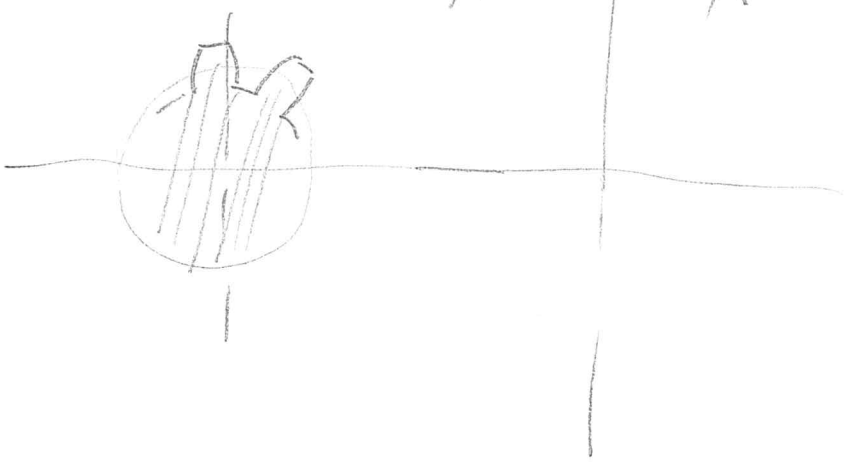
$$M = m f F \frac{r_1 + r_2}{2}$$

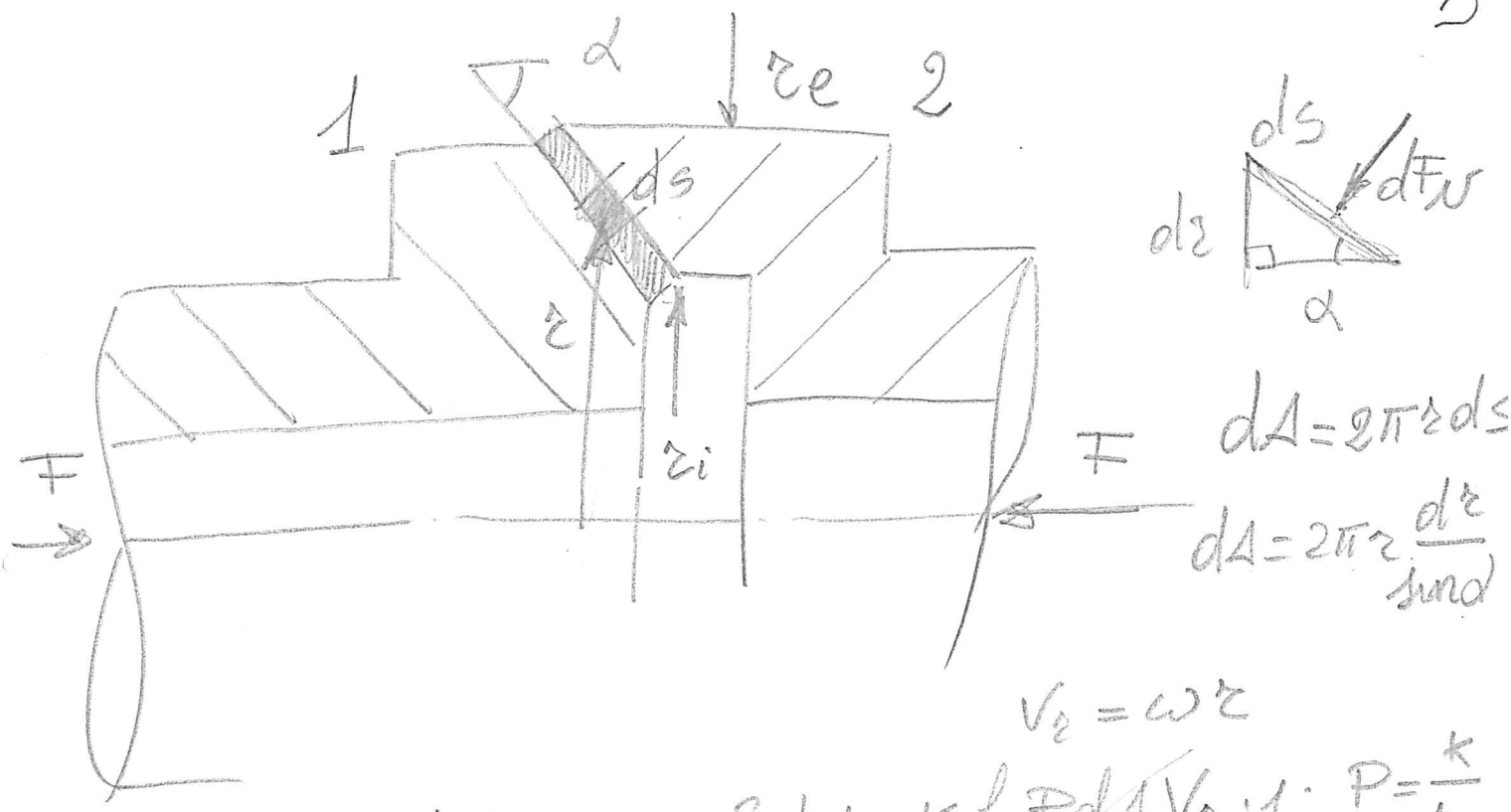












$$dA = 2\pi r\, ds \qquad dA = 2\pi r \frac{dr}{\operatorname{sen}\alpha}$$

$$V_2 = \omega r$$

$$\delta\, dA = K f P\, dA\, V_2 \cdot 1; \quad P = \frac{k}{r}$$

$$dF_N = P\, dA$$

$$F = \int_{F_N} dF_N \operatorname{sen}\alpha = \int_A P\, dA \operatorname{sen}\alpha =$$

$$= \int_{r_i}^{r_e} \frac{k}{r} 2\pi r \frac{dr}{\operatorname{sen}\alpha} \operatorname{sen}\alpha = K 2\pi (r_e - r_i)$$

$$M = \int_{F_N} r f\, dF_N = \int_A r f P\, dA = \int_{r_i}^{r_e} r f \frac{k}{r} 2\pi r \frac{dr}{\operatorname{sen}\alpha}$$

$$= \frac{f}{\operatorname{sen}\alpha} K 2\pi \frac{r_e^2 - r_i^2}{2} = \frac{f}{\operatorname{sen}\alpha} K 2\pi (r_e - r_i) \frac{(r_e + r_i)}{2} =$$

$$= \frac{f}{\operatorname{sen}\alpha} F \frac{r_i + r_e}{2} = f' F \frac{r_i + r_e}{2}$$

CAVALLO

$h = 100\,mm$ $\quad T, W?$

$R = 20\,mm$

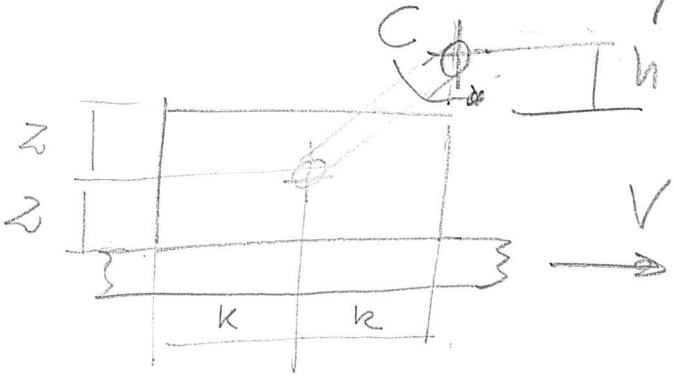
$z = 25\,mm$

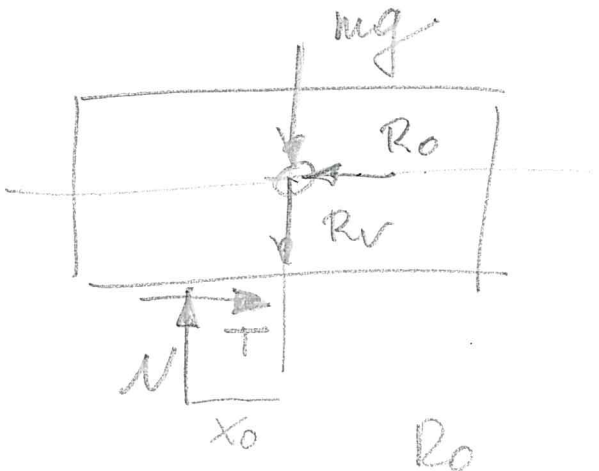
$f = 0{,}15$

$m = 7\,kg$

$V = 5\,m/s$

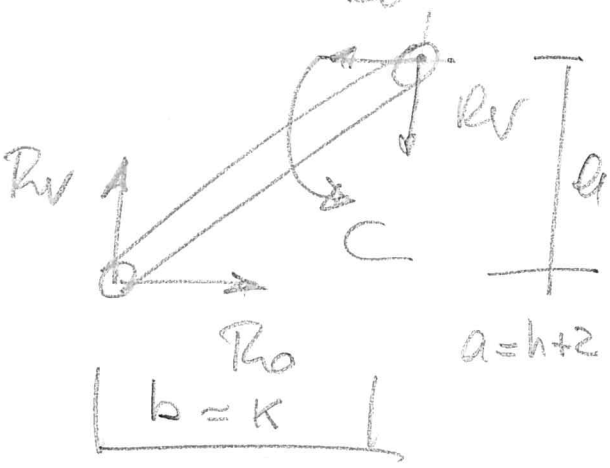
$C = 40\,Nm$





$$\begin{cases} T = f N \\ T - R_o = 0 \\ N - R_v - mg = 0 \\ C + R_o a - R_v b = 0 \end{cases}$$

T, N, R_o, R_v



$$T = f N = f(R_v + mg)$$

$$R_v = \frac{C + R_o a}{b}$$

$$T = f\left(\frac{C + R_o a}{b} + mg\right) = f\left(\frac{C + Ta}{b} + mg\right)$$

$$Tb = fC + fTa + fbmg$$

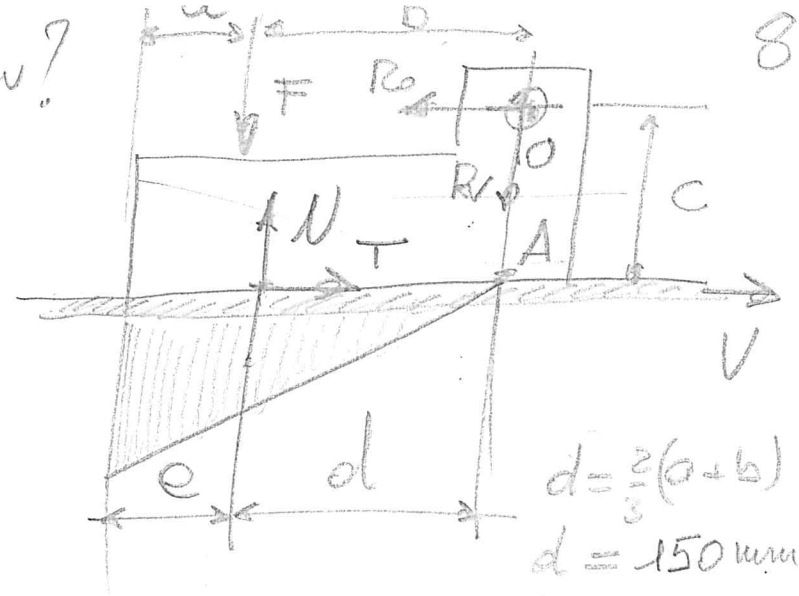
$$T(b - fa) = fC + fbmg$$

$$T = 131\,N$$

$$W = T \cdot V = 131.5 = 655\,W$$

$a = 50\,mm$
$b = 175\,mm$
$c = 75\,mm$
$f = 0,1$
$F = 500\,N$

T, Ro, Rv ?



$d = \frac{2}{3}(a+b)$

$d = 150\,mm$

$T = fN$

a) $Fb + Tc - Nd = 0$

$Fb + Tc - \frac{T}{f}d = 0$

$T\left(-c + \frac{d}{f}\right) = -Fb$

$$T = \frac{Fb}{c + \frac{d}{f}} = \frac{500 \cdot 0,175}{-0,075 + \frac{0,150}{0,1}} = \frac{87,5}{1,425}$$

$T = 61,40\,N$

$N = \frac{T}{f} = 614,0\,N$

$T - Ro = 0$

$N - F - Rv = 0$

$Ro = T = 61,4\,N$

$Rv = N - F = 614,0 - 500 =$
$= 114,0\,N$

$M = 100\ kg$

$C = 0{,}3\ m$

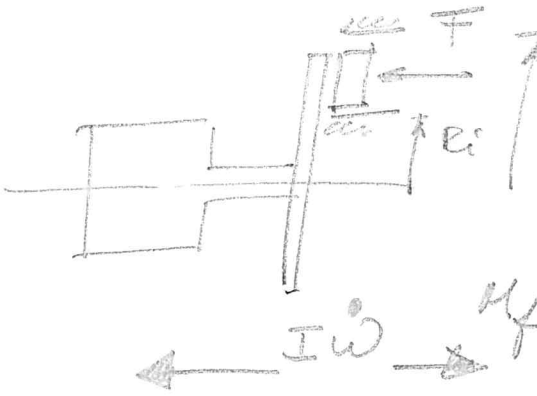
$\omega_0 = 1500\ g/1' = 157\ \frac{rad}{s}$

$R_i = 0{,}15\ m$

$R_e = 0{,}20\ m$

$f = 0{,}3$

$\Delta t = 10\ s$ $\quad M_f\ ?$



$M_f - I\dot{\omega} = 0 \qquad M_f = I\dot{\omega} \qquad I = M \cdot C^2 = 9\ kg\ m^2$

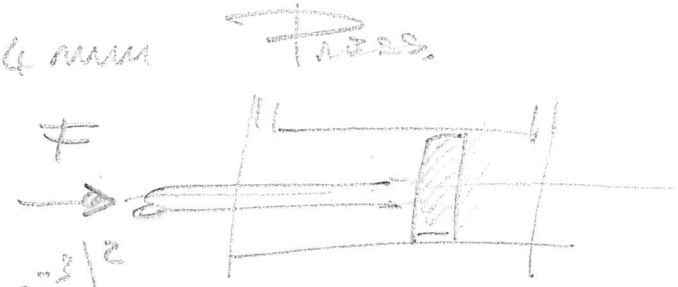
$0 - \omega_0 = \dot{\omega} t \qquad \dot{\omega} = \frac{\omega_0}{t} = 15{,}71\ \frac{rad}{s^2}$

$M_f = I\dot{\omega} = 9 \cdot 15{,}71 = 141{,}39\ Nm$

$M_f = f \cdot F \cdot \frac{R_i + R_e}{2}, \qquad F = \frac{2\,M_f}{f(R_i + R_e)} =$

$F = \frac{2 \cdot 141{,}39}{0{,}3(0{,}15 + 0{,}20)} = 2693{,}14\ N$

$\phi = 1'' \qquad \phi = 25{,}4\ mm$



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

$A = \pi \frac{\phi^2}{4} = \frac{\pi}{4} (25{,}4 \cdot 10^{-3})^2$

$A = 4{,}13 \cdot 10^{-3}\ m^2; \qquad P = \frac{F}{A} = \frac{2693{,}14}{4{,}13 \cdot 10^{-3}} = 6{,}5 \cdot 10^5\ \frac{N}{m^2}$

$P = 6{,}5\ bar$