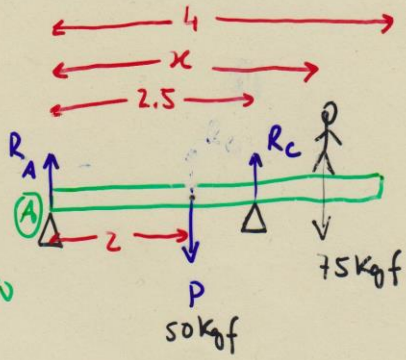
(9)

$$\left.\begin{array}{l}\sum \vec{F}_i = 0 \\ \sum \vec{\tau}_i = 0\end{array}\right\}$$ EQUILIBRIO ESTÁTICO



$$\Leftrightarrow \left|\begin{array}{l} \overset{=0}{R_A} - 50 + R_C - 75 = 0 \\ 0 \times R_A - 2 \times 50 + 2.5 R_C - 75 \times x = 0 \end{array}\right.$$

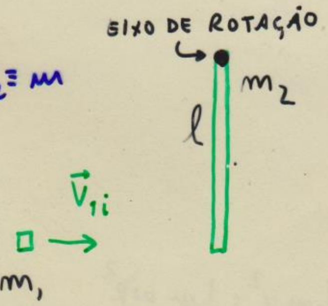
MOMENTOS CALCULADOS EM RELAÇÃO AO PONTO (A).

$$\Leftrightarrow \quad R_C = 125 \text{ Kgf}$$

$$x = 2.83 \text{ m}$$

(17)

$m_1 = m_2 \equiv m$



ANTES DO CHOQUE

$$L_{1i} = m_1 v_i l \; ; \; L_{2i} = 0$$

DEPOIS DO CHOQUE

$$L_f = I_{SIST.}\,\omega = (I_1 + I_2)\,\omega$$

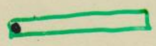
$$= \left(\frac{1}{3} m l^2 + m l^2\right)\omega$$

$$= \frac{4}{3} m l^2 \omega$$

BARRA:

$$I_{CM} = \frac{1}{12} M l^2$$

$$I = I_{CM} + M\left(\frac{l}{2}\right)^2$$



$$= \frac{1}{3} M l^2$$

CONSERVAÇÃO DE L:

$$L_i = L_f \Leftrightarrow \cancel{m} V_{1i} \cancel{l} = \frac{4}{3} \cancel{m} l^{\cancel{2}} \omega$$

$$\Rightarrow \omega = \frac{3}{4} \frac{V_{1i}}{l}$$

18

IMEDIATAMENTE DEPOIS DO CHOQUE

$$L_i = \underbrace{\frac{4}{3} m l^2}_{I_{sist.}}\,\omega \quad \text{(DO PROB. 24)}$$

NO FINAL (V=0)

$$L_f = 0$$

b) $$\tau = I_{sist.}\,\alpha \Leftrightarrow \alpha = \frac{\tau}{I_{sist.}} = \frac{\tau}{\frac{4}{3} m l^2} = \frac{3\tau}{4 m l^2}$$

a) EQ. CINEMÁTICAS DE ROTAÇÃO

$$\begin{cases} \theta = \overset{0}{\theta_0} + \omega_0 t - \frac{1}{2}\alpha t^2 \\ \underset{0}{\omega} = \omega_0 - \alpha t \end{cases} \quad \begin{cases} \theta = \omega_0 t - \frac{1}{2}\alpha t^2 \\ 0 = \omega_0 - \alpha t \end{cases} \quad \begin{cases} \frac{s}{l} = \omega_0 t - \frac{1}{2}\alpha t^2 \\ t = \frac{\omega_0}{\alpha} \end{cases}$$

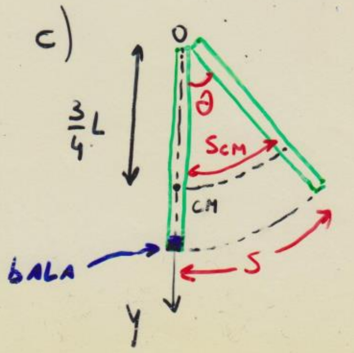
$$\frac{s}{l} = \omega_0\left(\frac{\omega_0}{\alpha}\right) - \frac{1}{2}\alpha\left(\frac{\omega_0}{\alpha}\right)^2 = \frac{1}{2}\frac{\omega_0^2}{\alpha}$$

$\omega_0 = \frac{3}{4}\frac{V_{1i}}{l}$ (DO PROB 24)

$$\frac{s}{l} = \frac{\left(\frac{3}{4}\frac{V_{1i}}{l}\right)^2}{2\left(\frac{3\tau}{4 m l^2}\right)} \Leftrightarrow s = \frac{3 m l V_{1i}^2}{8\tau}$$

CORRIGIR SOLUÇÃO NAS FOLHAS TP.

c)



$$y_{CM} = \frac{\sum m_i r_i}{\sum m_i} = \frac{\overbrace{m\frac{l}{2}}^{BARRA} + \overbrace{m l}^{BALA}}{m+m} = \frac{3}{4}L$$

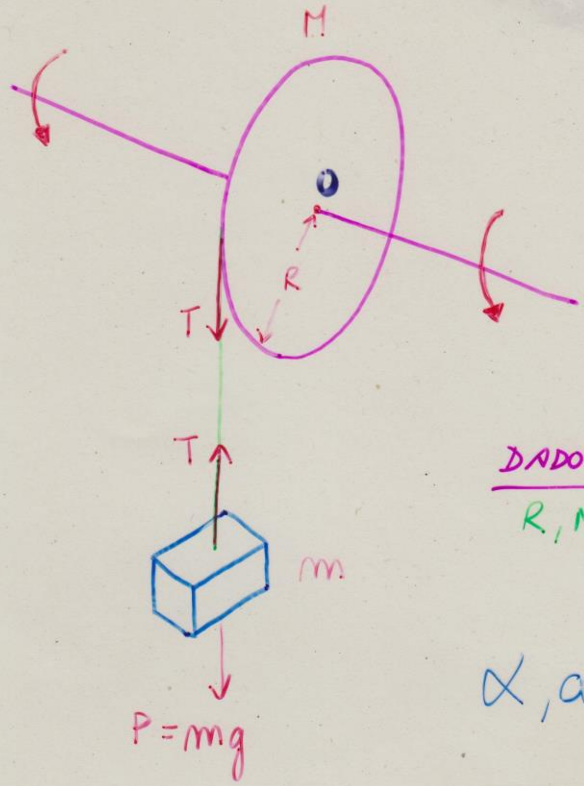
$$S = \theta l \Leftrightarrow \theta = \frac{S}{l}$$

$$S_{CM} = \theta\,\frac{3}{4}l$$

$$\Rightarrow S_{CM} = \frac{S\,3l}{4l} = \frac{3}{4}S$$

+9

$\boxed{\text{EXEMPLO}}$ PARA RESOLVER PROBLEMAS 19, 20 e 21 DO CAP. 6.



DADOS SÃO:

R, M, I e m

α, a e T = ?

$$\tau_{total} = I\alpha = T.R \Rightarrow \alpha = \frac{TR}{I}$$

APLICANDO 2ª LEI DE NEWTON:

$$\Sigma F = T - mg = -ma \Rightarrow a = \frac{mg - T}{m}$$

$$a = R\alpha = \frac{TR^2}{I} = \frac{mg - T}{m}$$

$$\Rightarrow T = \frac{mg}{1 + \frac{mR^2}{I}} \;;\; a = \frac{g}{1 + I/mR^2} \;;\; \alpha = \frac{a}{R} = \frac{g}{R + I/mR}$$

PROB 19

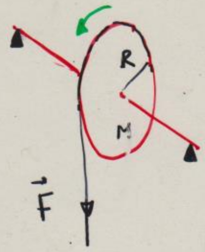
$M = 20\,kg$

$R = 0.5\,m$

$\vec{F} = 9.8\,N$

$\alpha = ?$

$\omega(2) = ?$



$$\tau = I\alpha = TR$$

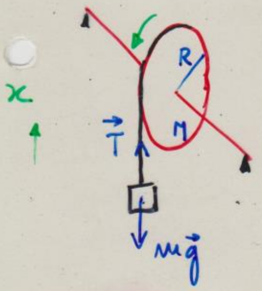
$$\Leftrightarrow \alpha = \frac{TR}{I} \quad \text{onde } \vec{T} \equiv \vec{F}$$

$$\Leftrightarrow \alpha = \frac{9.8 \times 0.5}{\frac{1}{2} \times 20 \times 0.5^2} = 1.96\ rad/s^2$$

$$\alpha = \frac{d\omega}{dt}, \text{ integrando: } \omega = \omega_0 + \alpha t \quad (\omega_0 = 0)$$

$$\omega = \alpha t = 1.96 \times 2 = 3.92\ rad/s$$

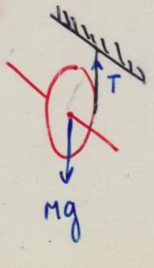
PRO 20



$$\alpha = \frac{a}{R} = \frac{g}{R + \frac{I}{mR}} = \frac{9.8}{0.5 + \frac{\frac{1}{2} \times 20 \times 0.5^2}{1 \times 0.5}}$$

$$\Leftrightarrow \alpha = 1.8\ rad/s^2$$

PRO 21



$$\alpha = \frac{TR}{\underbrace{I + MD^2}_{\text{TEOREMA DE STEINER}}} = \frac{20 \times 9.8 \times 0.5}{\frac{1}{2} 20 \times 0.5^2 + 20 \times 0.5^2} = 13.1\ rad/s^2$$

$$a = \alpha R = 13.1 \times 0.5 = 6.5\ m/s^2$$