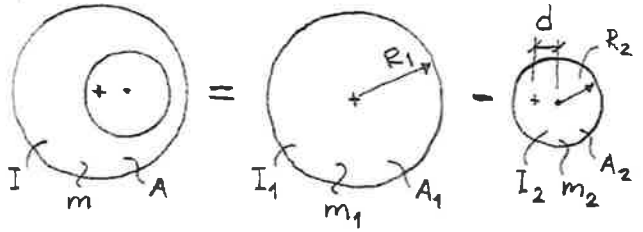
Seminarie pass 19

1)



Enl. Forelåsn. : $I_1 = \frac{1}{2} m_1 R_1^2$

Förflyttningssatsen : $I_2 = \frac{1}{2} m_2 R_2^2 + m_2 d^2$

$I = I_1 - I_2$

Area $A_1 = \pi R_1^2$, $A_2 = \pi R_2^2$

$R_2 = \frac{1}{2} R_1 \Rightarrow A_2 = \frac{A_1}{4}$ och $A = \frac{3}{4} A_1$

Dvs $A_1 = \frac{4}{3} A$ och $A_2 = \frac{1}{3} A$

Då är också $m_1 = \frac{4}{3} m$ och $m_2 = \frac{1}{3} m$

Alltså

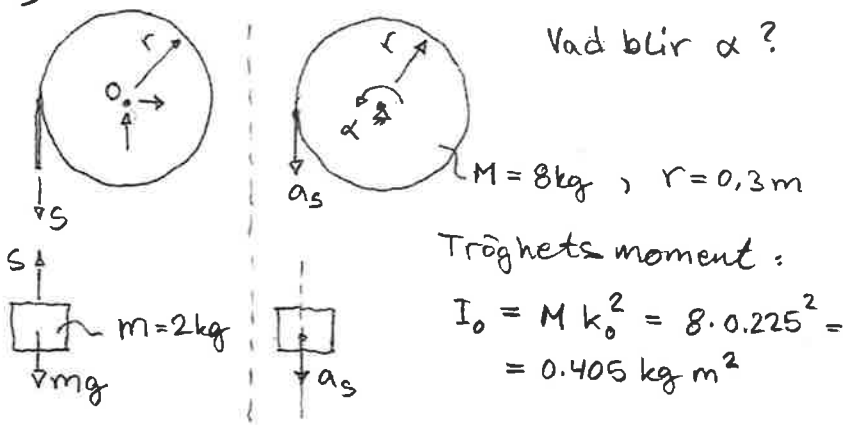
$I_1 = \frac{1}{2} \frac{4}{3} m R_1^2$, $I_2 = \frac{1}{2} \frac{1}{3} m R_2^2 + \frac{1}{3} m d^2$

$I = m \left(\frac{2}{3} R_1^2 - \frac{1}{6} R_2^2 - \frac{1}{3} d^2 \right)$

Tröghetsradie : $I = m k_o^2 \Rightarrow$

$$k_o = \sqrt{\frac{2}{3} 0.3^2 - \frac{1}{6} 0.15^2 - \frac{1}{3} 0.1^2} = 0.23 \text{ m}$$

2)



Vad blir α ?

Tröghetsmoment :

$I_o = M k_o^2 = 8 \cdot 0.225^2 =$

$= 0.405 \text{ kg m}^2$

$\circlearrowleft_O$ $S \cdot r = I_o \alpha$ ... (1) (Skivan)

$(\downarrow)$ $mg - S = m a_s$, $a_s = r\alpha \Rightarrow$

$S = mg - mr\alpha$ ... (2) (vikten)

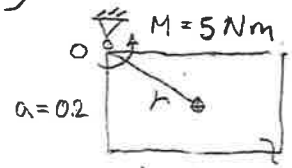
Eliminera S : (1) → (2) $\Rightarrow$

$\frac{I_o \alpha}{r} = mg - mr\alpha$; $\alpha \left(\frac{I_o}{r} + mr \right) = mg$;

$$\alpha = \frac{mg}{I_o/r + mr} = \frac{2 \cdot 9.81}{0.405/0.3 + 2 \cdot 0.3} =$$

$= 10.1 \text{ rad/s}^2$

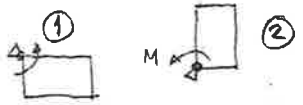
3)



Appendix II ⇒

$$\begin{cases} I_o = \frac{m}{3}(a^2+b^2) = 0.647\ \text{kgm}^2 \\ r = \sqrt{\left(\frac{a}{2}\right)^2+\left(\frac{b}{2}\right)^2} = 0.246\ \text{m} \end{cases}$$

* Energisamband:

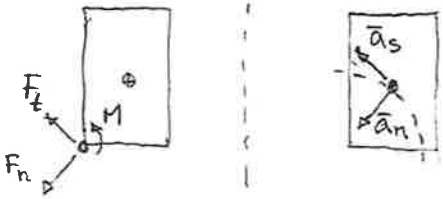


$W^{ik} = \Delta T$ (ingen pot. energi)

$W_{ik} = M \cdot \frac{\pi}{2}$ och $T_1 = 0$ ≙ $T_2 = \frac{1}{2} I_o \omega^2$ ⇒

$M\frac{\pi}{2} = \frac{1}{2} I_o \omega^2$; $\omega = \sqrt{\frac{M\pi}{I_o}} = \sqrt{\frac{5\cdot\pi}{0.647}} = 4.93\ \text{rad/s}$

* Frilägging i läge ②:



$$\begin{cases} \bar{a}_s = r\alpha \\ \bar{a}_n = r\omega^2 \end{cases}$$

(↙) $F_n = m\bar{a}_n$; $F_n = mr\omega^2$ ... (1)

(↖) $F_t = m\bar{a}_t$; $F_t = mr\alpha$ ... (2)

↶O $M = I_o\alpha$; $\alpha = \frac{M}{I_o}$ ... (3)

(1) ⇒ $F_n = 8 \cdot 0.246 \cdot 4.93^2 = 47.8\ N$

(3) i (2) ⇒ $F_t = mr\frac{M}{I_o} = 8 \cdot 0.246 \cdot \frac{5}{0.647} = 15.2\ N$

⇒ $R = \sqrt{F_n^2 + F_t^2} = \underline{50.2\ N}$