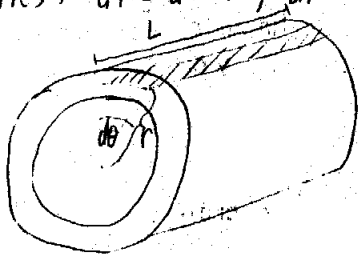


Solución: Velocidad constante $\Rightarrow \omega = \text{cte} \Rightarrow \sum \vec{T} = 0 \Rightarrow T_{\text{externo}} = T_{\text{resistente}}$

$$T_{\text{ext}} = F_{\text{za}} \cdot \text{dist} = Mgb \quad (1) \quad (0,5)$$

Tres: $dT = dF \cdot r$; $dF = \tau \cdot dA$; Ec de Newton-Navier: $\tau = \mu \cdot r \cdot \frac{d\omega}{dr}$



$$dA = L \cdot r \cdot d\theta$$

$$\therefore dT = \mu \cdot r \cdot \frac{d\omega}{dr} \cdot L r d\theta \cdot r = \mu L r^3 \frac{d\omega}{dr} d\theta$$

$$\int_0^T dT = \int_0^{2\pi} \mu L r^3 \frac{d\omega}{dr} d\theta \Leftrightarrow T = 2\pi \mu L r^3 \frac{d\omega}{dr} \quad (1,0) \Leftrightarrow T dr = 2\pi \mu L r^3 d\omega$$

$$T \int_a^b \frac{1}{r^3} dr = 2\pi \mu L \int_0^{\omega} d\omega \Leftrightarrow T \left[-\frac{1}{2r^2} \right]_a^b = 2\pi \mu L [\omega]_0^{\omega} \Leftrightarrow \frac{T}{2} \left(\frac{1}{a^2} - \frac{1}{b^2} \right) = 2\pi \mu L \omega$$

$$T = \frac{4\pi \mu L \omega}{\left(\frac{1}{a^2} - \frac{1}{b^2} \right)} = \frac{4\pi \mu L \omega a^2 b^2}{b^2 - a^2} \quad (2) \quad (1,0)$$

Reemplazando (1) y (2) en (*): $\frac{4\pi \mu L \omega a^2 b^2}{b^2 - a^2} = Mgb \Leftrightarrow \omega = \frac{Mg(b^2 - a^2)}{4\pi \mu L a^2 b} \quad (0,5) \quad \frac{Mgb}{4\pi \mu L \left(\frac{1}{a^2} - \frac{1}{b^2} \right)}$

$\mu = 50 \text{ [cp]} = 50 \cdot 10^{-2} \text{ [poise]}; 1 \text{ [poise]} = 1 \left[\frac{\text{dyne}}{\text{cm} \cdot \text{seg}} \right] = 10^{-1} \left[\frac{\text{kg}}{\text{m} \cdot \text{seg}} \right] \Rightarrow 50 \text{ [cp]} = 5 \cdot 10^{-2} \left[\frac{\text{kg}}{\text{m} \cdot \text{seg}} \right]$

$$\Rightarrow \omega = \frac{75 \cdot 9,8 \cdot (2^2 - 1,995^2)}{4\pi \cdot 5 \cdot 10^{-2} \cdot 2 \cdot 1,995^2} = 1,47 \text{ [V/seg]}$$

b) Vel de $\Rightarrow v = \frac{d}{t} \Rightarrow t = \frac{d}{v}$; $v = \omega \cdot b \Rightarrow t = \frac{H}{\omega b} = \frac{1000}{1,47 \cdot 2} = 340 \text{ [seg]} \sim 5,7 \text{ [min]} \quad (1,0)$

c) $+\omega = -1,47 \text{ [V/seg]} \quad (2,0)$

OJO: EL SIGNO ES MUY IMPORTANTE