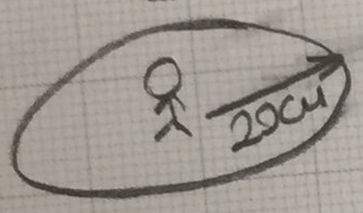
Tarih:...../...../20....

Konu:

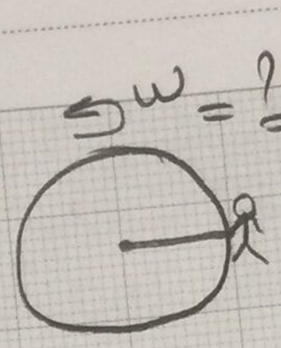
Ex.



$M_{disk} = 0,4\,kg$

$m_{mouse} = 30g = 0,03$

$r = 20cm$



$w_f = ?$

$I = \frac{1}{2} MR^2 = \frac{1}{2} \cdot 0,03 (0,02)^2$

$I = 6.10^{-6}$

$I_{disk} = \frac{1}{2} MR^2 = \frac{1}{2} 0,4(0,2)^2 = 0,008\,kgm^2$

$I_{sys} = I_{disc} + I_{mouse} = \frac{1}{2} MR^2 + mR^2$

$= \frac{1}{2} \cdot 0,4 \cdot (0,2)^2 + (30.10^{-3}) \cdot (0,2)^2 = 9,2.10^{-3}\,kgm^2$

$I_i . w_i = I_f . w_f$

$L_i = L_f$ => Angular momentum conservation

$w_f = \frac{I_i . w_i}{I_f}$

$w_f = \frac{I_i . w_i}{I_f} = \frac{8.10^{-3} . 82}{9,2.10^{-3}} = 71,3\,rad/s.$

$I_{isy} = I_{disk} + I_{mouse} = \frac{1}{2} MR^2 + 0$

$I_{isys} = \frac{1}{2} \cdot 0,4 \cdot (0,2)^2$

$I_{isys} = 8.10^{-3}\,kgm^2$

b) $K = \frac{1}{2} I w^2$

$\Delta L = L_f - L_i = \frac{1}{2} I_f w_f^2 - \frac{1}{2} I_i . w_i^2$

$= \frac{1}{2} \cdot 9,2 \cdot 10^{-3} \cdot 71,3^2 - \frac{1}{2} \cdot 8.10^{-3} \cdot 82^2$

$\Delta L = -3,5J$

LOST!..

Tarih:...../...../20....

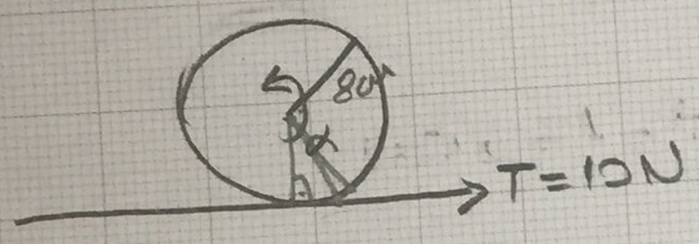
Konu:

c) $\theta = \frac{1}{2}(w_f + w_i) \cdot t \Rightarrow \theta = \frac{1}{2}(0 + 41,3) \cdot 0,988 \Rightarrow \theta \simeq 21\ rad.$

$\frac{1\ rev}{x} \cdot \frac{2\pi\ rad}{21\ rad}$

$\theta = x = 3,32\ rev.$

HW.



A cord is wrapped around the rim of a non-uniform cylinder of radious 80cm. The cord is pulled so that it has a constant tension of 10N. Starting from rest ($w_i = 0$), the disc makes 15,2 revolutions in 10 seconds. ($w_f = 15,2\ rev \cdot 2\pi\ rad$)

a.) what was the final angular velocity of the disk? ($w = 19,1\ rad/s$)

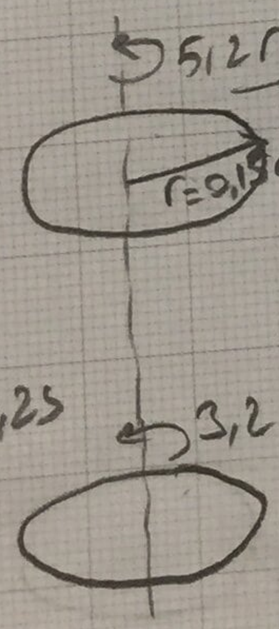
b.) what was the angular acceleration of the disk? ($\alpha = 1,91\ rad/s$)

c) what was the magnitude of the torque exerted on the disk? ($\tau = 0,8N/M$)

d.) what is the moment of inertia of the disk? ($I = 0,419\ kgM^2$)

e.) what was the final kinetic energy of the disk? ($K = 76,4J$)

Ex.



$I_{wheel} = 0,250\ kg.$

a) $\alpha = ?$

$\frac{5,2\ rev}{s} \cdot \frac{2\pi\ rad}{1\ rev} = 32,656\ rad/s = w.$

$I = m \cdot R^2$

$0,125 = \frac{1}{2} M \cdot (0,15)^2$

$0,5 = M \cdot 0,0225$

$M = 22,2$

$\alpha = \frac{\Delta w}{\Delta t} = \frac{3,2\ rev}{s} \cdot 2\pi$

Konu: Tarih:...../...../20....

$$\alpha = \frac{\Delta\omega}{\Delta t} = \frac{3{,}2\frac{rev}{s}\cdot\frac{2\pi rad}{1rev} - 5{,}2\frac{rev}{s}\cdot\frac{2\pi rad}{1rev}}{4{,}2\ second} \Rightarrow \alpha = -2{,}99\ rad/s$$

b) $a_T = \alpha \cdot r$

$= 2{,}99 \cdot 0{,}15$

$= -0{,}45\ rad/s^2$

c) $\tau = I \cdot \alpha$

$\tau = 0{,}25\,(-2{,}99)$

$\tau \cong -0{,}75\ Nm$

d) $\theta = \frac{1}{2}(\omega_f + \omega_i)\cdot t$

$= \frac{1}{2}(3{,}2+5{,}2)\frac{rev}{s}\cdot 4{,}2 \Rightarrow \theta = 17{,}6\ rev.$

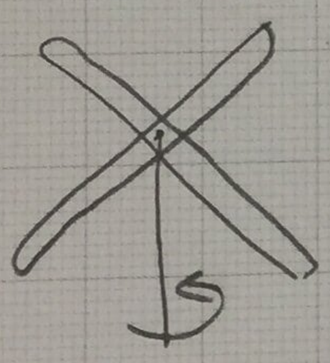
e) $W = \Delta K$

$K_f - K_i = \frac{1}{2} I \omega_f^2 - \frac{1}{2} I \omega_i^2 = W$

$W = \frac{1}{2} \cdot 0{,}25 \cdot (3{,}2 \cdot 2\pi - 5{,}2 \cdot 2\pi)$

$W \cong -83\ J.$

Ex.



Two thin bars, each of lenght 2m and mass 2,5kg and mass 2,5kg and rotating them about their centers. Stating from rest, a constant torque is exerted on the rotor such that after 8s, it has 855J. of kinetic energy

$L = 2m$

$M = 2{,}5kg$

$t = 8s$

$K = 855J$

$\omega_f = ?$

$\tau = ?$

$I = \frac{1}{12} ML^2$

$I_{sys} = 2 \cdot \frac{1}{12} ML^2 = 2 \cdot \frac{1}{12} \cdot 2{,}5 \cdot 2^2 = 1{,}67\ kgm^2$

$K = \frac{1}{2} \cdot I_{sys} \cdot \omega_f^2$

$855 = \frac{1}{2}(1{,}67) \cdot \omega_f^2 \Rightarrow \omega_f = 32\ rad/s.$

b) $\tau = I \cdot \alpha \Rightarrow \tau = 1{,}67 \cdot 4 = 6{,}67\ N/m$

$\omega_f = \omega_i + \alpha t$

$32 = 0 + \alpha 8$

$\alpha = 4$

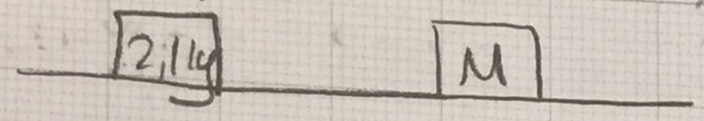
Konu:

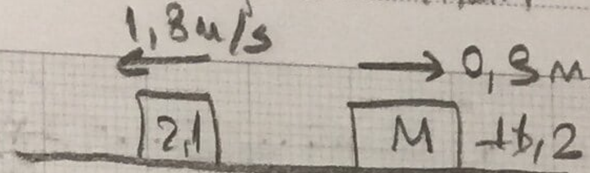
Tarih:...../...../20....

13,86 - 6,3 =

3,78 + 10,08

8.)





$m_1 . v_{1i} + m_2 . v_{2i} = m_1 . v_{1f} + m_2 . v_{2f}$

$2,1 . 3 + M.0 = -2,1 . 1,8 + M . 0,9$

$6,3 + 3,78 = M . 0,9$

$M = 11,2 kg.$

- b) Impulse = $I \Delta p$

$I = p_f - p_i = (2,1(-1,8) - 2,1 3)$

$I = -10,1 kg m/s.$

$\frac{1}{2} M v_1^2 + \frac{1}{2} M v_2^2 = \frac{1}{2} M v_{1f}^2 + \frac{1}{2} M v_{2f}^2$

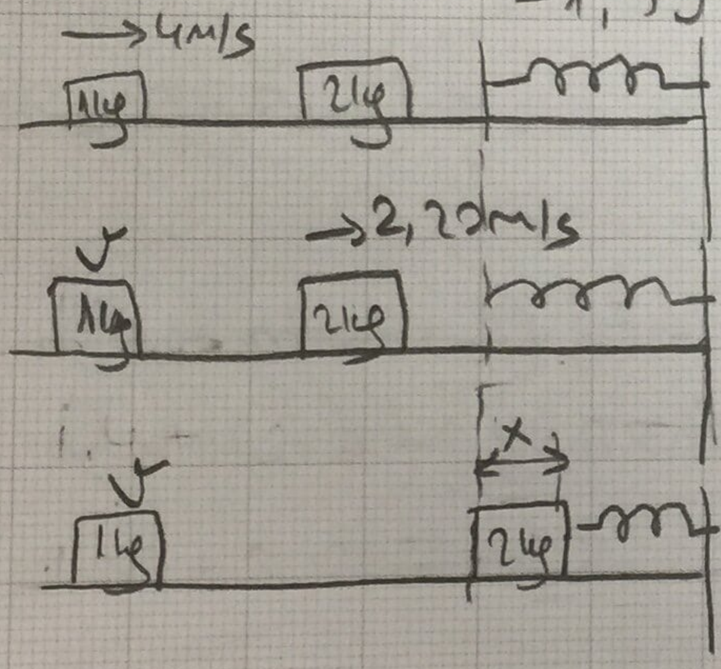
$\frac{1}{2} . 2,1 . 9 + \frac{1}{2} . (11,2) . 0 = \frac{1}{2} 2,1 (1,8)^2 + \frac{1}{2} . 11 . (0,9)^2$

$9,45 = 3,4 + 4,455$

$9,45 = 7,85$

$-1,595$ Lost.

4.)



$k = 750 N/M$

$m_1 . v_{1i} + m_2 v_{2i} = m_1 . v_{2f} + m_2 . v_{2f}$

$1.4 + 2.0 = v.1 + 2.2,2$

$v = -0,4 m/s \leftarrow$

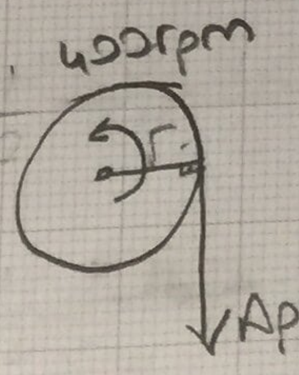
b) $E_i = E_f$

$\frac{1}{2} m v^2 = \frac{1}{2} k x^2$

$2,1 (2,2)^2 = 750 . x^2$

$x = \sqrt{\frac{4,84}{750}} = 0,11 M.$

5.



$I = 0,150 kgm^2$

$I = M . R^2$

$400 . rpm = \frac{1 rad}{rev.} = 2\pi =$ bre 400rpm

$\omega_f = 0$

$t = ?$

$400 rpm = 2\pi = 1 rad . \frac{1 min}{60 s}$

$\omega = 41,9 rad/s$

$\omega_f - \omega_i = \alpha t$

$0 - 41,9 = -42 . t$

$t = 0,998 s.$

$\tau = I . \alpha$

$6,30 = 0,150$

$\alpha = 42 rad/s^2$