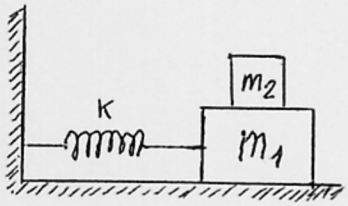
SOLUCIONES FISICA I - 24-VI-05

1er Problema:



1) $f_1 = \sqrt{\frac{K}{m_1}} = 2\,Hz \Rightarrow \frac{K}{m_1} = 4 \Rightarrow K = 4m_1$

$f_2 = \sqrt{\frac{K}{m_1+m_2}} = 1\,Hz \Rightarrow \frac{K}{m_1+m_2} = 1 \Rightarrow K = (m_1+m_2)$

$4m_1 = m_1 + m_2 = m_1 + 3 \Rightarrow 3m_1 = 3 \Rightarrow m_1 = 1\,Kg$

2) $K = 4m_1 = 4 \cdot 1 = 4\,N/m$

3) $x = 0'25 \operatorname{sen}(4\pi t + \pi/2)$ (m)
$x_2 = 0'25 \operatorname{sen}(2\pi t + \pi/2)$ (m)

$\omega_1 = 2\pi f_1 = 4\pi$; $\omega_2 = 2\pi/2 = 2\pi$

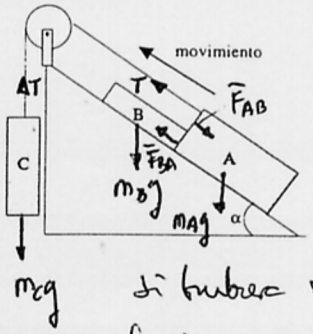
4) $(F_{roz})_{MAX} = \mu N = \mu m_2 g = 0'5 \cdot 3 \cdot 10 = 15\,N$

$a_{MHA} = \omega_2^2 x = \omega_2^2 A = 4\pi^2 \cdot 0'25 = 9'86\,m/s^2 \Rightarrow F_{inercia} = m_2 a_{MAX} = 3 \cdot 9'86 = 29'59\,N$

$\omega_2 = 2\pi$

Como $F_i > F_{roz} \Rightarrow$ No se desplaza

2º Problema



Aplicando la 2ª ley de Newton a cada bloque tenemos

(A): $-F_{AB} + T - m_A g \operatorname{sen}\alpha = m_A a$

(B) $F_{BA} - m_B g \operatorname{sen}\alpha = m_B a$

(C) $-T + m_C g = m_C a$

3 ecuaciones con 3 incognitas $F_{AB} = -F_{BA}$, T y a

resolviendo sale $a = 1'46\,m/s^2$; $T = 102'48\,N$; $F_{BA} = 25'6\,N$

Si hubiera rozamiento

$a' = 3\,m/s^2$

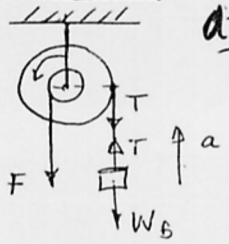
(A) $-F'_{AB} + T' - m_A g \operatorname{sen}\alpha - \mu m_A g \cos\alpha = m_A \cdot a'$

$F'_{BA} - m_B g \operatorname{sen}\alpha - \mu m_B g \cos\alpha = m_B a'$

$-T' + m'_C \cdot g = m_C \cdot a'$

$F'_{AB} = 34'5\,N$; $T' = 137'82\,N$; $m'_C = 19'69\,Kg$

3er Problema



a) Polea: $\sum M_{EXT} = I\alpha$

$FR_1 - T_1 R_2 = I\alpha$

$I = m_p \cdot K^2$

Caja: $\sum F_{ext} = m\vec{a}$

$T - W_B = m_B a$

Como no desliza $\Rightarrow a = \alpha R_2$

$F\frac{R_1}{R_2} - W_B = \left(\frac{I}{R_2} + m_B R_2\right)\alpha \Rightarrow \alpha = 11'41\,rad/s^2$

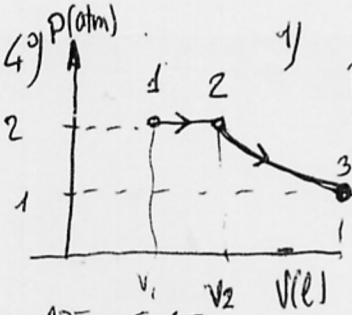
b) $T = m_B(a+g) = 10(2'85 + 9'81) = 126'6\,N$

$a = \alpha R_2 = 2'85\,m/s^2$

c) $E_c = \frac{1}{2} I \omega^2 = \frac{1}{2} m_{polea} \cdot K^2 \omega_F^2 = 299'9\,J$

$\omega_F = \omega_0 + \alpha t = 11'41 \cdot 3 = 34'23\,rad/s$

4º



1) (1) $P_1 = 2\,atm$; $T_1 = 127°C = 400\,K$

$V_1 = \frac{nRT_1}{P_1} = \frac{1 \cdot 0'082 \cdot 400}{2} = 0'164\,l$

(2) $P_2 = P_1 = 2\,atm$; $V_2 = 2V_1 = 0'328\,l$

$T_2 = \frac{P_2 V_2}{nR} = 800\,K$

(3) $P_3 = \frac{P_2}{2} = 1\,atm$; $V_3 = \frac{nRT_3}{P_3} = 0'65\,l$

$T_3 = T_2 = 800\,K$

2) $W_{12} = P\Delta V = 2(0'348 - 0'164) = 0'368\,atm \cdot l = 37'23\,J$

$W_{23} = nRT_2 \operatorname{Ln}\frac{V_3}{V_2} = 1 \cdot 8'31 \cdot \ln 2 = 57'6\,J$

$R = 8'31\,J/mol$

3) $Q_{12} = W_{12} + \Delta U_{12} = 0'368\,atm \cdot l + 1 \cdot 3(800 - 400) = 504'37\,J$

$Q_{23} = W_{23} + \Delta U_{23} = W_{23} = 57'6\,J$

$\Delta U = nC_v \Delta T$