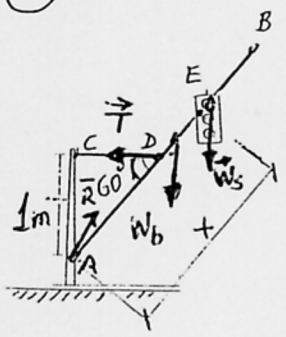
FISICA I - SEPT 2006
SOLUCIONES

1º



a) $\Sigma \vec{F} = \vec{0}$ → $R_y - m_b g - m_s g = 0$

$R_x - T = 0$

ΣM_A (+) → $m_b g\, 2\cos 60 + m_s g \times \cos 60 - T \cdot 1 = 0$

$T = R_x$ $\quad R_y = m_b g + m_s g = 5\cdot 10 + 10\cdot 10 = 150\,N$

$5\cdot 10 \cdot 2\,\frac{1}{2} + 10\cdot 10 \times \frac{1}{2} = T = 50 + 50x = 50(1+x)$

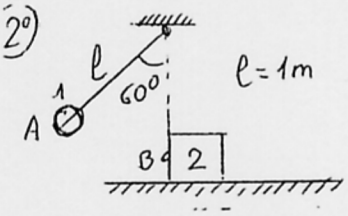
b) $T_R = 50(1+x) = 225 \Rightarrow x = 3'5\,m$ c) $x = 3'5 \Rightarrow T = 200\,N$

$T = 200\,N$

$R_x = T = 200\,N$ $\quad R_y = 150\,N$ $\quad \vec{R} = 200\vec{i} + 150\vec{j}\,(N)$

$200\,N$ $\quad 200\vec{i}$

2º



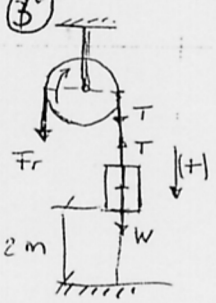
a) $mgL - mgl\cos 60 = \frac{1}{2} m V_1^2$

$gl(1-\cos 60) = 10\cdot 10\left(1-\frac{1}{2}\right) = 50 = \frac{1}{2} V_1^2 \Rightarrow V_1 = 10\,(m/s)$

b) $m_1 V_1 = m_1 V_1' + m_2 V_2' \Rightarrow 10 = V_1' + V_2'$

$e = 1 = \frac{V_2' - V_1'}{V_1} = \frac{V_2' - V_1'}{10} \Rightarrow V_2' - V_1' = 10 \rightarrow V_1' = 0\,m/s$ $\quad V_2' = 10\,m/s$

3º



$W - T = m \cdot a$

$T \cdot R - F_t \cdot R = I \cdot \alpha$

$a = \alpha \cdot R$

$I = \frac{1}{2} m_{polea} \cdot R^2$

$W - T = a\left(m + \frac{1}{2} m_p\right)$

$a = \frac{200\times 10 - 900}{200 + 70} = 4,07\,m/s^2$

Cabina: $E_c = \frac{1}{2} m v^2 = 1628\,J$

$v^2 = v_0^2 + 2as = 2\times 4,07 \times 2 = 16,28\,(m/s)$

Polea $E_c = \frac{1}{2} I \omega^2 = \frac{1}{2}\cdot\frac{1}{2} m_p R^2 \left(\frac{v}{R}\right)^2 = \frac{1}{4} m_p v^2$

$= \frac{1}{4} \times 140 \times 16,28 = 569,8\,J$

$\Delta E_m = E_{m,i} - E_{m,F} = m\cdot g h - (E_{c,cabina} + E_{c,polea}) =$

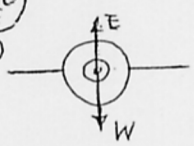
$= 200\times 10\times 2 - 2190,8 =$

$= 1809,2\,J$

$\frac{\Delta E_m}{E_{m,i}} = 0,452 \Rightarrow 45,2\%$

4º

a)



$\Sigma \vec{F} = 0 \Rightarrow W = E$

$\rho_{sol} \cdot g \cdot V_{sol} = \rho_{fluido} \cdot g \cdot V_{sum}$

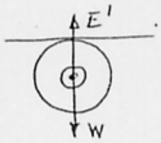
$V_{sol} = V_{ext} - V_{int} = \frac{4}{3}\pi (R_{ext}^3 - R_{int}^3)$

$V_{sum} = \frac{1}{2}\cdot\frac{4}{3}\cdot\pi R_{ext}^3 = \frac{2}{3}\pi R_{ext}^3$

$\rho_{sol} = \frac{V_{sum}}{V_{sol}}\,\rho_{fluido} = \frac{1}{2}\rho_{fluido}\,\frac{R_{ext}^3}{R_{ext}^3 - R_{int}^3}$

$\rho_{sol} = \frac{1}{2}\times 0.8 \times \frac{10^3}{10^3 - 9^3} = 1.47\,g/cm^3$

b)



$W = E'$, $W = E$ $\Big\}$ $E = E'$

$\rho_{fluido} \cdot g \cdot V_{sum} = \rho_{fl}\, g\, V_{fl}$

$\rho_{fluido} = \rho_{fluido}\,\frac{V_{sum}}{V_{sum}}$

$= \rho_{fluido}\,\frac{1}{2} = 0.4\,g/cm^3$