SOLUCION - FISICA I - 25/VI/07

1)

(a) Antes del choque: $\frac{1}{2}Kx^2 = \frac{1}{2}mv_1^2$

$v_1^2 = \frac{K}{m}x^2 = \frac{1000}{20\times10^{-3}}\cdot(3\times10^{-2})^2 = 45\ (m/s)^2$

$\boxed{v_1 = 6,7\ m/s}$

Choque: $mv_1 = mv_1' + M\cdot v_2'$

$20\cdot v_1 = 20v_1' + 100\cdot v_2' \Rightarrow v_1 = v_1' + 5v_2'$

$e = -\frac{(v_2'-v_1')}{v_2-v_1} = 0,5 \Rightarrow -\frac{(v_2'-v_1')}{0-6,7} = 0,5$

$\Rightarrow \boxed{\begin{matrix} v_2' = 1,67\ m/s \\ v_1' = -1,65\ m/s \end{matrix}}$ Velocidades finales.

(b) $E_{m,i} = \frac{1}{2}Kx^2 = \frac{1}{2}\times1000\times(3\times10^{-2})^2 = 0,45\ J$

$E_{m,F} = \frac{1}{2}mv_1'^2 + \frac{1}{2}Mv_2'^2 = 0,16\ J$

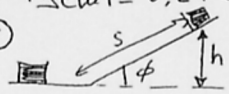
$|\Delta E_m| = 0,29\ J$

$E_{m,i} = E_{m,F} + |W_{roz}|$

$\frac{1}{2}M(v_2')^2 = M\cdot g\cdot h + \mu_c\cdot M\cdot g\cdot\cos(30^\circ)\cdot s$

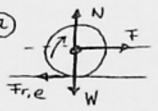
$s = h/\mathrm{sen}(30^\circ)$ $\quad h = 10'55\ cm$

(c)



2)

(a)



Mov. del c.m.: $F - F_{r,e} = M\cdot a_{cm}$

Rotación: $R\cdot F_{r,e} = I\cdot\alpha$

No desliza: $a_{cm} = \alpha\cdot R$

$I = M\cdot R^2$ $\Rightarrow$

$\boxed{a_{cm} = \frac{F}{2M} = \frac{600}{2\times230} = 1,30\ m/s^2}$

(b) $E_c = \frac{1}{2}Mv_{cm}^2 + \frac{1}{2}I\omega^2 = \frac{1}{2}Mv_{cm}^2 + \frac{1}{2}MR$

$= M\cdot v_{cm}^2$

M.R.U.A. $v_{cm} = v_0 + a_{cm}t = 3,9\ m/s$

$E_c = 3498,3\ J$

(c) $F_{r,e} = \frac{I}{R}\cdot\alpha = \frac{I}{R}\cdot\frac{a_{cm}}{R} = M\cdot a_{cm} \le \mu_e\cdot N = \mu_e$

$\boxed{\mu_e \ge \frac{M\cdot a_{cm}}{M\cdot g} = 0,13}$

3)

(a)

Waparente = W − E

$E_{H_2O} = 1,2 - 1,06 = 0,14\ N$

$E_{glic.} = 1,2 - 1,03 = 0,17\ N$

$E_{H_2O} = \rho_{H_2O}\cdot g\cdot V_{sum.}$

$E_{glic.} = \rho_{glic.}\cdot g\cdot V_{sum.}$

$\frac{E_{H_2O}}{E_{glic.}} = \frac{\rho_{H_2O}}{\rho_{glic.}} \Rightarrow \boxed{\rho_{glic.} = 10^3\times\frac{0,17}{0,14} = 1,21\times10^3\ \frac{Kg}{m^3}}$

(b) $W = m\cdot g$

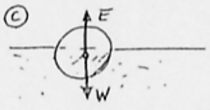
$E_{H_2O} = \rho_{H_2O}\cdot g\cdot V_{sum.} = \rho_{H_2O}\cdot g\cdot V_{bola}$

↳ totalmente sumergida

$\frac{W}{E_{H_2O}} = \frac{m\cdot g}{\rho_{H_2O}\cdot g\cdot V_{bola}} = \frac{\rho_{bola}}{\rho_{H_2O}} \Rightarrow$

$\boxed{\rho_{bola} = \frac{1,2}{0,14}\times10^3 = 8,57\times10^3\ Kg/m^3}$

(c)



$\sum\vec{F} = 0 \Rightarrow W = E_{H_2O}$

$\rho_{bola}\cdot g\cdot V_{bola} = \rho_{H_2O}\cdot g\cdot V_{sum.}$

$\frac{V_{sum.}}{V_{bola}} = \frac{\rho_{bola}}{\rho_{H_2O}} = 0,63$ → 63% sumergido

→ 37% emergente

4)

a) $y = 0,25\cdot\mathrm{sen}(0,05\cdot t - 0,2\cdot x)$

$y = 0,25\cdot\mathrm{sen}\ 2\pi\cdot\left(\frac{0,05}{2\pi}\cdot t - \frac{0,2}{2\pi}\cdot x\right)$

$y = 0,25\cdot\mathrm{sen}\ 2\pi\cdot\left(\frac{t}{2\pi/0,05} - \frac{x}{2\pi/0,2}\right)$

$A = 0,25\ m$

$T = \frac{2\pi}{0,05} = 40\cdot\pi\ s.$

$\lambda = 10\pi\ m.$

$V = \frac{\lambda}{T} = \frac{10\cdot\pi}{40\cdot\pi} = \frac{1}{4} = 0,25\ m/s$ $\quad \boxed{V = 0,25\ m/s}$

b) $y(2,0'5) = 0'25\ \mathrm{sen}(0'05\cdot0'5 - 0'2\cdot2) = 0'09\ m$

$\boxed{y = 9\ cm}$

c) $y = 0,25\cdot\mathrm{sen}(0,05\cdot t - 0,2\cdot x)$

$V = \frac{ds}{dt} = -0,25\cdot0,05\cdot\cos(0,05\cdot t - 0,2\cdot x)$

$V = -0,0125\cdot\cos(0,05\cdot t - 0,2\cdot x)$

$V(10\ s,\ 2,5\ m) = -0,0125\cdot\cos(0,05\cdot10 - 0,2\cdot2,5)$

$\boxed{V = 0'0125\ m/s}$