FISICA I SOLUCIONES 27/VI/11

1° $f = 50\ Hz \rightarrow T = \frac{1}{f} = \frac{1}{50}\ (s)$

$\lambda = v\,T = 30\ \frac{1}{50} = \frac{3}{5} = 0'6\ m$

a) Ecuación del movimiento

$$y(x,t) = A \operatorname{sen} 2\pi\left(\frac{t}{T} - \frac{x}{\lambda}\right) =$$

$$= \boxed{0'1 \operatorname{sen} 2\pi\left(50t - \frac{5}{3}x\right) = y(x,t)}$$

b) $y(0'6, t) = 0 \Rightarrow 0 = 0'1 \operatorname{sen} 2\pi\left(50t - \frac{5}{3}0'6\right)$

$\Rightarrow \operatorname{sen}(2\pi)(50t - 1) = 0 \Rightarrow 50t - 1 = 0 \Rightarrow$

$t = \frac{1}{50}\ (s)$

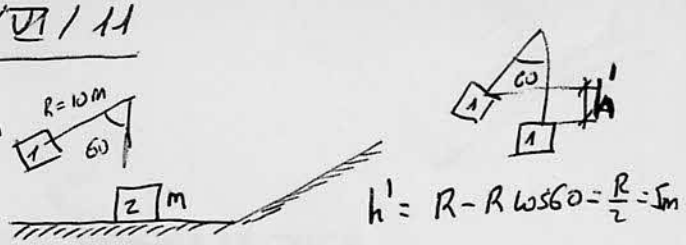
$$\boxed{y\left(1'05, \tfrac{1}{50}\right) = 0'1 \operatorname{sen} 2\pi\left(50\tfrac{1}{50} - \tfrac{5'25}{3}\right) =}$$

$$= 0'1 \operatorname{sen}\left(-\tfrac{3\pi}{2}\right) = \boxed{0'1\,m}$$

c) $v = \frac{dy(x,t)}{dt} = A\omega \cos 2\pi\left(\frac{t}{T} - \frac{x}{\lambda}\right) = 0'1\,\frac{2\pi}{1/50} \cdot$

$\cdot \cos 2\pi\left(50t - \frac{5}{3}x\right) = \boxed{10\pi \cos 2\pi\left(50t - \tfrac{5}{3}x\right)}$

2°



$h' = R - R\cos 60 = \frac{R}{2} = 5m$

$m_1 g h' = \frac{1}{2} m_1 v_1^2 \rightarrow v_1 = \sqrt{2gh_1} = \sqrt{2 \cdot 10 \cdot 5} = 10\,(m/s)$

$m_1 \vec{v}_1 + m_2 \vec{v}_2 = m_1 \vec{v}_1' + m_2 \vec{v}_2' \rightarrow 2mv_1 + mv_2 = 2mv_1' + mv_2'$

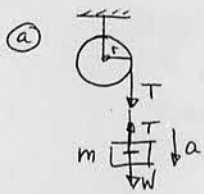
$2v_1 + v_2 = 2v_1' + v_2' \rightarrow \boxed{20 = 2v_1' + v_2'}$ ← $v_2' = 13'3\ m/s$

$e = 1 = \frac{v_2' - v_1'}{v_1 - v_2} = \frac{v_2' - v_1'}{v_1} \rightarrow \boxed{v_2' - v_1 = 10}$ ← $v_1' = 3'3\ m/s$

$\frac{1}{2} m_2 v_2'^2 = m_2 g h \rightarrow h = \frac{v_2'^2}{2g} = \frac{13'3^2}{20} = \frac{176'9}{20} = 8'84\ m$

$\frac{1}{2} m_1 v_1'^2 = m_1 g h_1 \rightarrow h_1 = \frac{v_1'^2}{2g} = \frac{3'3^2}{20} = \frac{10'9}{20} = 0'54\ m$

3°



ⓐ $\Sigma \vec{F} = m \cdot \vec{a} \Rightarrow W - T = m \cdot a$

$M_{ext} = I\alpha \Rightarrow T \cdot r = I \cdot \alpha$

$I = M \cdot R g^2,\ a = \alpha \cdot r \Rightarrow$

$I = 25 \times 0{,}1^2 = 0{,}25\ Kg \cdot m^2$

$\Rightarrow \boxed{a = \frac{W}{m + I/r^2} = \frac{m \cdot g}{m + I/r^2} = 5{,}74\ m/s^2}$

M.R.U.A. $s = v_0 t + \frac{1}{2} a t^2$ $\boxed{t = \sqrt{\frac{2s}{a}} = 1{,}67\,s}$

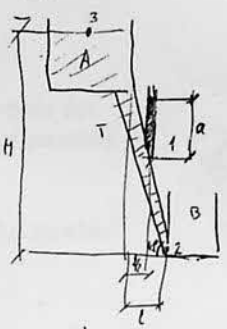
ⓑ $T = W - m \cdot a = m(g - a) = 63{,}7\ N$

ⓒ $E_c = \frac{1}{2} I \omega^2 = \frac{1}{2} I \left(\frac{v}{r}\right)^2$

$v^2 = v_0^2 + 2as = 2 \times 5{,}74 \times 8 = 91{,}84\ (m/s)^2$

$\boxed{E_c = \frac{1}{2} \times 0{,}25 \times \frac{91{,}84}{0{,}15^2} = 510{,}2\,J}$

4°



$H = 15\ m$
$l = 10\ m$
$\alpha = 45°$
$S_1 = 5\ m^2$
$S_2 = 3\ cm^2$

1) $P_3 = P_2 = P_0$ (atmosférica)

BERNOULLI 2 y 3

$P_3 + \frac{1}{2}\rho v_3^2 + \rho g z_3 = P_2 + \frac{1}{2}\rho v_2^2 + \rho g z_2$

$z_3 = H$, $z_2 = 0$, $v_3 \simeq 0$

$P_0 + \rho g H = P_0 + \frac{1}{2}\rho v_2^2$

$v_2 = \sqrt{2gH} = \sqrt{2 \cdot 10 \cdot 15} = 17'3$

$v_2 S_2 = v_1 S_1 \rightarrow v_1 = \frac{S_2}{S_1} v_2 = \frac{3}{5} 17'32 = 10'39$

2) Bernouilli 1-2 $z_2 = 0$

TMO FUNDAMENTAL HIDROSTATICA

$P_1 + \frac{1}{2}\rho v_1^2 + \rho g z_1 = P_2 + \frac{1}{2}\rho v_2^2 + \rho g z_2$

$P_1 = P_0 + \rho g a$

$P_0 + \frac{1}{2}\rho v_2^2 = P_0 + \rho g a + \frac{1}{2}\rho v_1^2 + \rho g \frac{l}{2}$

$$a = \frac{\frac{1}{2}\rho(v_2^2 - v_1^2) - \rho g \frac{l}{2}}{\rho g} = \frac{0'5(300 - 108) - 10 \cdot 5}{10} = 4'6\ m$$