FISICA I - FEBRERO - 2000

1º
$[P] = L^2MT^{-3}$
$[F] = LMT^{-2}$
$[l] = L$
$[\rho] = L^{-3}M$

$\Pi = P^{a_1}F^{a_2}l^{a_3}\rho^{a_4} = (L^2MT^{-3})^{a_1}(LMT^{-2})^{a_2}(L)^{a_3}(L^{-3}M)^{a_4} = L^0M^0T^0$

L: $2a_1 + a_2 + a_3 - 3a_4 = 0$
M: $a_1 + a_2 + a_4 = 0$
T: $-3a_1 - 2a_2 = 0$

$\begin{pmatrix} 2 & 1 & 1 & -3 \\ 1 & 1 & 0 & 1 \\ -3 & -2 & 0 & 0 \end{pmatrix}$ $h=3$ $i = n-h = 4-3 = 1$

1 MONOMIO Π

haciendo $a_1 = 1$ obtenemos $a_2 = -3/2$ $a_3 = 1$ $a_4 = 1/2$

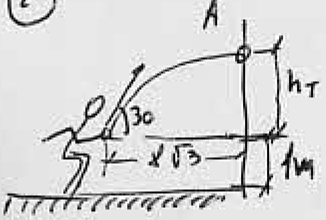
$\Pi = P^1 F^{-3/2} l^1 \rho^{1/2} \Rightarrow F(\Pi) = 0 \Rightarrow \Pi = K \Rightarrow Pl\sqrt{\frac{\rho}{F^3}} = K \rightarrow \boxed{P = \frac{K}{l}\sqrt{\frac{F^3}{\rho}}}$

MODELO	PROTOTIPO
ρ_M	$\rho_P = \rho_M$
$F_M = 10^3 N$	$F_P = ?$
P_M	$P_P = 5P_M$
l_M	$l_P = 10 l_M$

$\Pi_M = \Pi_P \Rightarrow P_M \cancel{l}\sqrt{\frac{\rho_M}{F_M^3}} = P_P l_P \sqrt{\frac{\rho_P}{F_P^3}} \Rightarrow P_M \frac{l_P}{10}\sqrt{\frac{\rho_M}{(10^3)^3}} = 5P_M\sqrt{\frac{\rho_M}{F_P^3}}$

operando $\boxed{F_P = 10^3\sqrt[3]{2500}}$

2º



1) $x = v_0\cos\alpha\, t = v_0\cos 30\, t = v_0\frac{\sqrt{3}}{2}t = 8\sqrt{3} \rightarrow 16 = v_0 t$

$V_y = V_{0y} - gt = 0 \Rightarrow V_{0y} = gt = V_0 \operatorname{sen} 30 = \frac{V_0}{2} = 10t \Rightarrow V_0 = 20t$

$16 = (20t)t = 20t^2 \rightarrow t = \sqrt{\frac{16}{20}} = \frac{4}{2\sqrt{5}} = \frac{2}{\sqrt{5}}$

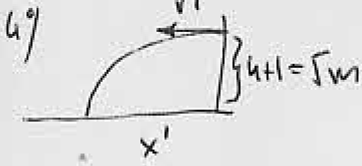
$\boxed{V_0 = 20\sqrt{\frac{16}{25}} = 4\sqrt{20} = 8\sqrt{5}\ m/s}$ $t_{sub} = \frac{2}{\sqrt{5}} = t_{bajad}$

2) $\boxed{h_T = \frac{1}{2}gt_b^2 = \frac{1}{2}10\left(\frac{2}{\sqrt{5}}\right)^2 = \frac{16}{4} = 4m}$

3) $e = \frac{v_2' - v_1'}{v_1 - v_2} = \frac{-v_1'}{v_1} = \frac{-v_1'}{4\sqrt{15}} ?? = 0'8 \rightarrow \boxed{v_1' = -3'2\sqrt{15}\ (m/s)}$

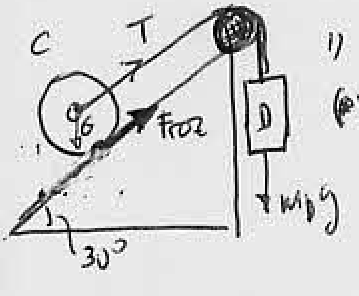
$v_2' \simeq v_2 \simeq 0$ $v_1 = v_0\cos\alpha = 8\sqrt{5}\frac{\sqrt{3}}{2} = 4\sqrt{15}\ (m/s)$

4)



$\boxed{x' = v_1' t' = 3'2\sqrt{15}\cdot 1 = 3'2\sqrt{15}\ m}$

$5 = \frac{1}{2}gt'^2 \rightarrow t' = \sqrt{\frac{10}{10}} = 1s$



1) (*)
$m_C g\operatorname{sen}\alpha - F_{roz} - T = m_C a$
$-m_D g + T = m_D a$
$a = \alpha R$
$F_{roz}\cdot R = \frac{1}{2}m_C R^2\frac{a}{R}$

$50\cdot 10\cdot\frac{1}{2} - 150 = \left(\frac{3}{2}50 + 15\right)a$

$\boxed{a = \frac{100}{90} = \frac{10}{9}\ (m/s^2)}$

2) $\boxed{T = m_D(g + a) = 15\left(10 + \frac{10}{9}\right) = 133'3N}$

(*) $m_C g\operatorname{sen}\alpha - m_D g = \left(\frac{3}{2}m_C + m_D\right)a$

3) $\boxed{F_{roz} = \frac{1}{2}m_C a = \frac{1}{2}50\frac{10}{9} = \frac{500}{18} = \frac{250}{9}\ N}$

$v(3) = v_0 + at = 0 + \frac{10}{9}\cdot 3 = \frac{30}{9} = \frac{10}{3}\ (m/s)$

$E_T = \frac{1}{2}m_C v^2 = \frac{1}{2}50\left(\frac{10}{3}\right)^2 = \frac{5000}{6} = \frac{2500}{3}$; $E_{CR} = \frac{1}{2}\frac{1}{2}50\cancel{R^2}\frac{v^2}{\cancel{R^2}} = \frac{50}{4}\frac{100}{9} = \frac{5000}{36}$