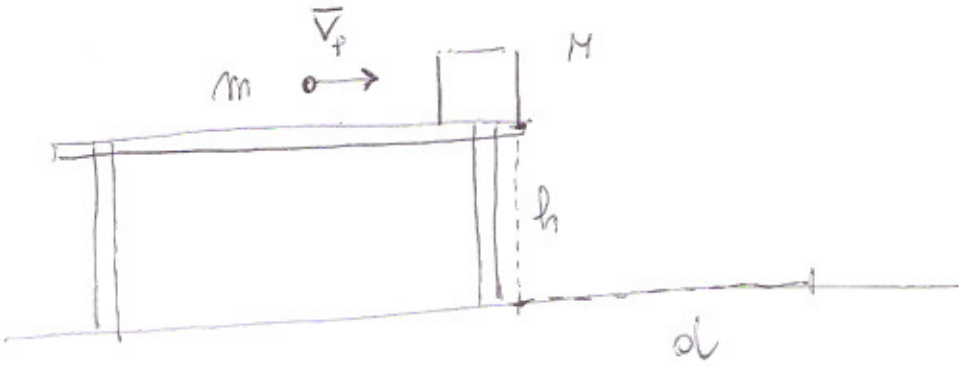
# RISOLUZIONE II PROVA DI VERIFICA 27-GIU-2012

## ESERCIZIO n. 1




$m = 0.2\ Kg$
$M = 3\ Kg$
$h = 0.9\ m$
$d = 1.5\ m$

LUNGO ASSE x $\quad \mathcal{P}^i_{TOT\,x} = \mathcal{P}^f_{TOT\,x}$

$$m V_p = (m+M)\bar{V} \qquad (1)$$

DOPO L'URTO IL BLOCCO CON DENTRO IL PROIETTILE FA UNA TRAIETTORIA PARABOLICA

$$\begin{cases} x(t) = x_0 + v_{0x}t + \frac{1}{2}a_x t^2 \\ y(t) = y_0 + v_{0y}t + \frac{1}{2}a_y t^2 \end{cases} \quad \begin{cases} V_x(t) = V_{0x} + a_x t \\ V_y(t) = V_{0y} + a_y t \end{cases}$$

$$\begin{cases} x_0 = 0 \\ y_0 = h \end{cases} \quad \begin{cases} V_{0x} = \bar{V} \\ V_{0y} = 0 \end{cases} \quad \begin{cases} a_x = 0 \\ a_y = -g \end{cases}$$

$$\begin{cases} x(t) = \bar{V}t \\ y(t) = h - \frac{1}{2}gt^2 \end{cases} \quad \begin{cases} V_x(t) = \bar{V} \\ V_y(t) = -gt \end{cases}$$

QUANDO $y(t_v) = 0 \quad t_v = \sqrt{2h/g}$

QUANDO $t = t_v \quad x(t_v) = d$

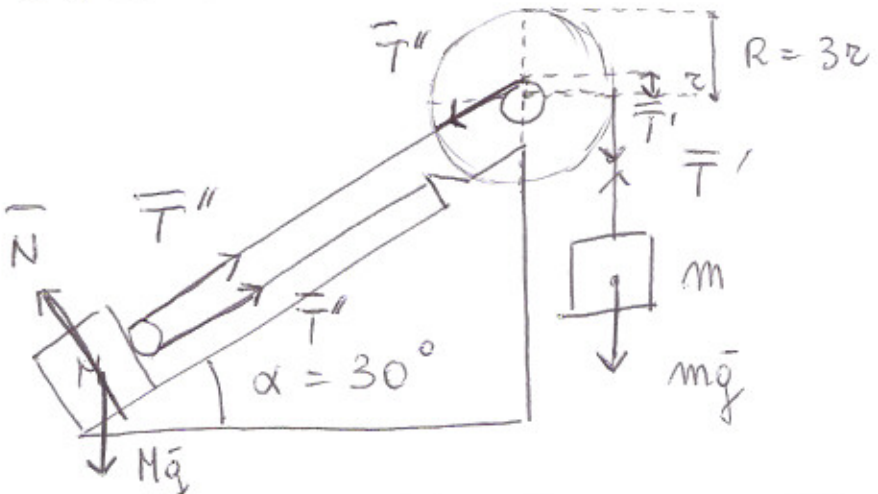
$$d = V\sqrt{2h/g} \Rightarrow V = d\sqrt{g/2h}$$

SOSTITUENDO NELLA (1)

$$m v_p = (m + M)\, d \sqrt{g/2h}$$

$$v_p = \left(\frac{m+M}{m}\right) d \sqrt{g/2h} \qquad v_p = 56 \text{ m/s}$$

ESERCIZIO n. 2




$M = 1500$ Kg

IMPONENDO LA CONDIZIONE DI EQUILIBRIO PER M, m E LA CARRUCOLA SI HA

MASSA m) $\quad m\bar{g} + \bar{T}' = 0 \qquad mg = T'$

MASSA M) $\quad \begin{cases} -Mg \sin\vartheta + T'' + T'' = 0 \\ -Mg \cos\vartheta = N \end{cases}$

$$Mg \sin\theta = 2T''$$

CARRUCOLA) POLO NEL CENTRO

$$+rT'' - RT' = 0 \qquad R = 3r$$

$$+rT'' = 3rT'$$

METTENDO INSIEME $\begin{cases} mg = T' \\ Mg\sin\theta = 2T'' \\ T'' = 3T' \end{cases}$

$$Mg\sin\theta = 6T'$$

$$Mg\sin\theta = 6mg$$

$$m = \frac{M\sin\theta}{6} \qquad m = 125\ kg$$

ESERCIZIO n. 3

$R = 2\ m$

$I_{INI} = 250\ kg\ m^2$

$\omega_{INI} = 10\ giri/min = 1.05\ rad/s$

$m_B = 25\ kg$

SI CONSERVA IL MOMENTO ANGOCARE

$$I_{INI}\,\omega_{INI} = I_{FIN}\,\omega_{FIN}$$

$$\omega_{FIN} = \frac{I_{INI}}{I_{FIN}}\,\omega_{INI}$$

$$I_{FIN} = I_{INI} + M_B R^2 \qquad I_{FIN} = 350\ kg\ m^2$$

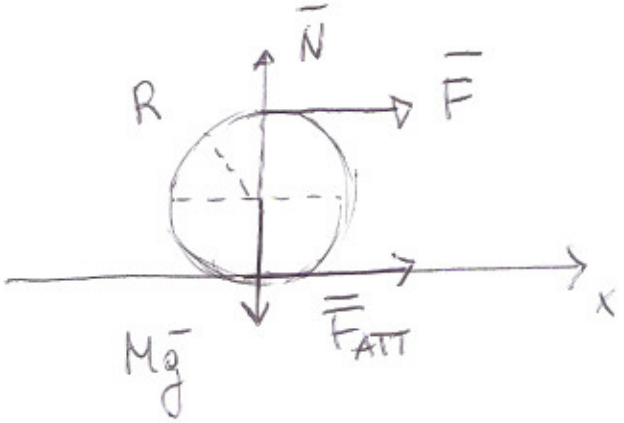
$$\omega_{FIN} = 7.1\ giri/min = 0.75\ rad/s$$

$$K_{INI} = \frac{1}{2} I_{INI}\,\omega_{INI}^2 \qquad K_{INI} = 138\ J$$

$$K_{FIN} = \frac{1}{2} I_{FIN}\,\omega_{FIN}^2 \qquad K_{FIN} = 98.4\ J$$

$$\Delta K = K_{FIN} - K_{INI} = -39.6\ J \quad (K_{FIN} < K_{INI})$$

ESERCIZIO n. 4




$\bar{F}$ COSTANTE

MOTO DI PURO ROTOLAMENTO

I eq. cardinale $\quad F + F_{ATT} = M a_{CM}$

II eq. cardinale (POLO NEL CENTRO) $\quad -RF + RF_{ATT} = I(-\alpha)$

$$\left( I = \frac{1}{2} M R^2 \right)$$

$$\begin{cases} F + F_{ATT} = M a_{cm} \\ -RF + RF_{ATT} = -\frac{1}{2} M R^2 \alpha \end{cases} \qquad \alpha = \frac{a_{cm}}{R}$$

$$\begin{cases} F + F_{ATT} = M a_{cm} \\ F - F_{ATT} = \frac{1}{2} M a_{cm} \end{cases}$$

$$\begin{cases} F_{ATT} = F - \frac{1}{2} M a_{cm} \\ F + F = \frac{1}{2} M a_{cm} + M a_{cm} \end{cases}$$

$$2F = \frac{3}{2} M a_{cm} \qquad \boxed{a_{cm} = \frac{4}{3}\frac{F}{M}}$$

$$F_{ATT} = F - \frac{1}{2} M \frac{2}{3} \frac{F}{M} = \frac{F}{3} \qquad \boxed{F_{ATT} = \frac{F}{3}}$$

IL MOTO DEL CENTRO MASSA E' UN MOTO UNIFORM. ACCELERATO

$$\begin{cases} x_{cm}(t) = \frac{1}{2} a_{cm} t^2 \\ V_{cm}(t) = a_{cm} t \end{cases}$$

$$x_{cm} = d \qquad t_d = \sqrt{\frac{2d}{a_{cm}}} \qquad V_{cm}(t_d) = a_{cm}\sqrt{\frac{2d}{a_{cm}}}$$

$$V_{cm}(t_d) = \sqrt{2d a_{cm}} = \sqrt{\frac{8dF}{3M}}$$