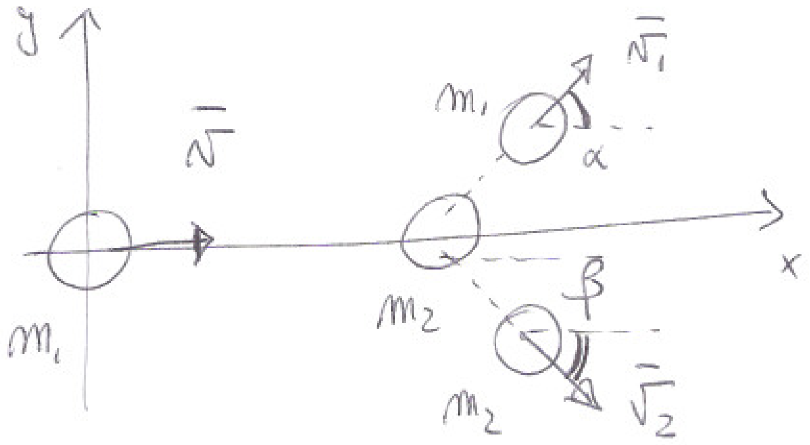
RISOLUZIONE II PROVA DI VERIFICA
28/05/2015

ESERCIZIO n. 1



$|\bar{v}| = 2 \, m/s$

$m = 5 \, Kg$

$m_1 = m_2 = m$

$\alpha = 30°$

$\beta = 60°$

SISTEMA ISOLATO $\overline{P}^i_{TOT} = \overline{P}^f_{TOT}$

$$\begin{cases} P^i_{TOT\,x} = P^f_{TOT\,x} \\ P^i_{TOT\,y} = P^f_{TOT\,y} \end{cases} \qquad \begin{cases} m_1 v_x = m_1 v_{1x} + m_2 v_{2x} \\ 0 = m_1 v_{1y} + m_2 v_{2y} \end{cases}$$

$$\begin{cases} v_{1x} = + v_1 \cos 30° \\ v_{1y} = + v_1 \sin 30° \end{cases} \qquad \begin{cases} v_{2x} = + v_2 \cos 60° \\ v_{2y} = - v_2 \sin 60° \end{cases} \qquad \begin{cases} v_x = +2 \, m/s \\ v_y = 0 \end{cases}$$

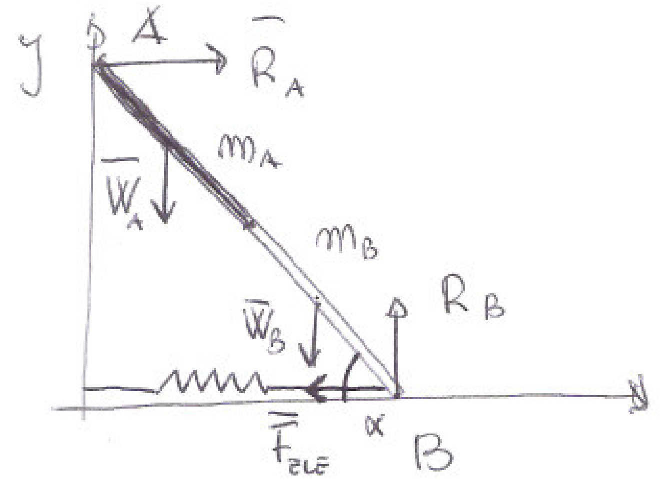
con $m_1 = m_2 = m$

$$\begin{cases} v_x = v_{1x} + v_{2x} \\ v_{1y} = - v_{2y} \end{cases}$$

$v_1 = 1.7 \, m/s \; (1.54 \, m/s)$

$v_2 = 1.0 \, m/s \; (0.89 \, m/s)$

Esercizio n. 2



$m_A = 3\,Kg$

$m_B = 4\,Kg$

$L_A = L_B = L/2$

$\alpha = 45°$

$K = 15\ N/cm$

$$\begin{cases} \sum \bar{F}_{EXT} = 0 \\ \sum \bar{m}(\bar{F}_{EXT}) = 0 \end{cases}$$

$\sum \bar{F}_{EXT} = 0$

$\bar{R}_A + \bar{R}_B + \bar{W}_A + \bar{W}_B + \bar{F}_{ELE} = 0$

asse x) $-F_{ELE} + R_A = 0$

asse y $-W_A - W_B + R_B = 0$

$$\begin{cases} R_A = F_{ELE} \\ R_B = W_A + W_B \qquad R_B = 68.6\ N \end{cases}$$

Polo in B $\quad \bar{m}(\bar{R}_B) = 0$

$\bar{m}(\bar{F}_{ELE}) = 0$

$\bar{m}(\bar{W}_B) \Rightarrow +\frac{L}{4} m_B g \sin\alpha$

$\bar{m}(\bar{W}_A) \Rightarrow +\frac{3}{4} L\, m_A g \sin\alpha$

$\bar{m}(\bar{R}_A) \Rightarrow -L R_A \cos\alpha$

$+\frac{\cancel{L}}{4} m_B g \sin\alpha + \frac{3}{4}\cancel{L}\, m_A g \sin\alpha - \cancel{L} R_A \cos\alpha = 0$

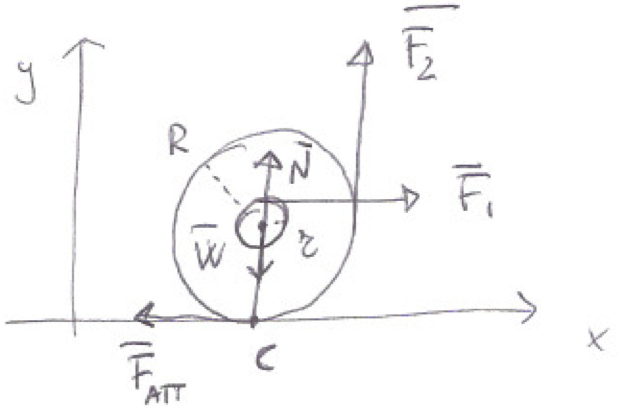
$\alpha = 45°$ $\quad \sin\alpha = \cos\alpha$

$$R_A = \left(\frac{m_B}{4} + \frac{3}{4} m_A\right) g \qquad R_A = 31.85\ N$$

$$|\bar{F}_{ELE}| = K x_{eq} \qquad x_{eq} = \frac{R_A}{K} \qquad x_{eq} = 2.1\ cm$$

ESERCIZIO n. 3

I parte



$R = 10$ cm

$r = 6.5$ cm

$m = 5$ Kg

$\mu = 0.3$

$F_1 = 9.5$ N

CONDIZ. DI EQUILIBRIO

$$\begin{cases} \sum \overline{F}_{EXT} = 0 \\ \sum \overline{m}(\overline{F}_{EXT}) = 0 \end{cases}$$

$$\sum \overline{F}_{EXT} = 0$$

$$\overline{F}_1 + \overline{F}_2 + \overline{N} + \overline{W} + \overline{F}_{ATT} = 0$$

$$\begin{cases} -\overline{F}_{ATT} + \overline{F}_1 = 0 \\ +\overline{F}_2 + N - W = 0 \end{cases}$$

$$\begin{cases} F_1 = F_{ATT} \\ F_2 = W - N \end{cases}$$

POLO IN C (PUNTO DI CONTATTO)

$\overline{m}(\overline{F}_{ATT}) = 0 \qquad m(\overline{N}) = 0 \qquad \overline{m}(\overline{W}) = 0$

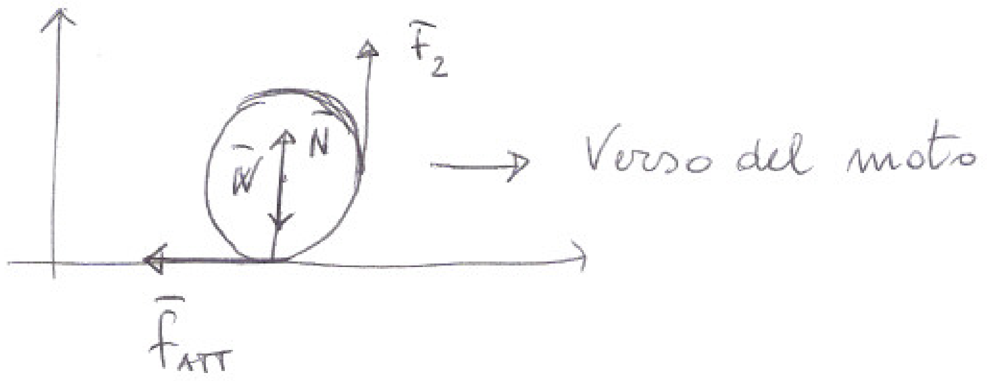
$\overline{m}(\overline{F}_1) \Rightarrow -(R+r)F_1$

$\overline{m}(\overline{F}_2) \Rightarrow +RF_2$

$$R F_2 - \left((R + r) F_1 \right) = 0$$

$$F_2 = \frac{R + r}{R} F_1 \qquad F_2 = 15.8 \text{ N}$$

II parte



$$\Sigma \bar{F}_{EXT} = m \bar{a}_{cm} \qquad \begin{cases} -f_{ATT} = m a_{cm} \\ +F_2 + N - W = 0 \end{cases}$$

$$\Sigma \bar{m} (\bar{F}_{EXT}) = I \bar{\alpha}$$

POLO NEL PUNTO DI CONTATTO E ASSE DI ROTAZIONE PASSANTE PER IL PUNTO DI CONTATTO $\left(I = \frac{3}{2} m R^2 \right)$

$$R F_2 = I \alpha \qquad R F_2 = \frac{3}{2} m R^2 \frac{a_{CM}}{R}$$

IN CONDIZIONI DI PURO ROTOLAMENTO $\alpha = \frac{a_{CM}}{R}$

$$F_2 = \frac{3}{2} m a_{cm}$$

$$a_{cm} = \frac{2}{3}\frac{F_2}{m}$$

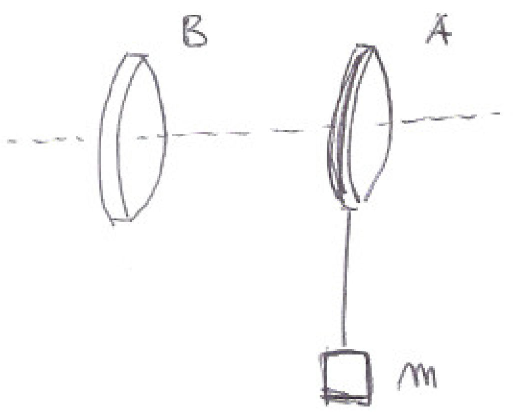
$$-f_{ATT} = \cancel{m}\,\frac{2}{3}\frac{F_2}{\cancel{m}}$$

Numericamente $|f_{ATT}| = \frac{2}{3}F_2 = 10.5$

$|f_{ATT}| \leq \mu N = 10$

Non si ha puro rotolamento

ESERCIZIO n. 4



$M_A = M_B = M$

$M = 5\ kg$

$R_A = R_B = R$

$R = 0.2\ m$

$\omega_i = 0.15\ rad/s$

$$\bar{L}^{i}_{TOT} = \bar{L}^{f}_{TOT}$$

$$\bar{L}^{i}_{TOT} \Rightarrow I_i \omega_i \qquad I_i = \frac{1}{2} M R^2 + m R^2$$

$$\bar{L}^{f}_{TOT} \Rightarrow I_f \omega_f \qquad I_f = \frac{1}{2} M R^2 + m R^2 + \frac{1}{2} M R^2$$

$$I_i \omega_i = I_f \omega_f$$

$$\omega_f = \frac{I_i}{I_f} \omega_i$$

$$\omega_f = \frac{(M/2 + m)\cancel{R^2}}{(M + m)\cancel{R^2}} \omega_i$$

$$\omega_f = 0.095\ rad/s$$