MR 2018
SOLUZIONI TEMI D'ESAME

MR 16.01.2018

Es. 1:

1) $I_{11} = I_{22} = \frac{17}{30} ml^2$

$I_{33} = 2 I_{11}$

$I_{12} = -\frac{1}{4} ml^2$

2) $I_{\Delta_S} = \frac{13}{60} ml^2$

3) $I_{\Delta_C} = \frac{49}{60} ml^2$

Es. 2

1) $\vec{\omega}_c = -\frac{\dot{x}}{2R} \vec{k}$

$\vec{\omega}_D = -\left(\frac{\dot{x}}{R} + \dot{\varphi}\right) \vec{k}$

2) $U = mgx + mgR\cos\left(\varphi - \frac{\pi}{6}\right) - \frac{(\sqrt{3}+2)}{\pi R} x^2 + \frac{\sqrt{3}}{2} mgx + \frac{\sqrt{3}}{2} mgR\varphi + c$

3) $\left(\frac{\pi R}{4}, \frac{\pi}{2}\right)$; $\left(\frac{\pi R}{4}, \frac{5}{6}\pi\right)$

4) $T = \frac{1}{2} m \left[\frac{7}{2} \dot{x}^2 + R(1 + 2\cos\varphi)\dot{x}\dot{\varphi} + \frac{3}{2} R^2 \dot{\varphi}^2 \right]$

5) $\vec{K}_O = \frac{mR}{2} \left[(2\cos\varphi - 5)\dot{x} + R\dot{\varphi} \right] \vec{k}$

MR 27.03.2018

Es. 1:

1) $I_{11} = I_{22} = \frac{17}{30} m l^2$

$I_{33} = 2 I_{11}$

$I_{12} = \frac{1}{4} m e l^2$

2) $I_r = \frac{19}{60} m e l^2$

3) $I_s = \frac{49}{60} m l^2$

Es. 2:

1) $\vec{\omega}_{A\Theta} = \dot{\Theta} \vec{k}$

$\vec{\omega}_{AC} = -\dot{\Theta} \vec{k}$

2) $U = -\frac{3}{2} mgL \cos^2\Theta + \frac{3}{2} mgL \cos\Theta + c$

3) $\Theta = 0$; $\Theta = \pi$, $\Theta = \frac{\pi}{3}$, $\Theta = \frac{5}{3}\pi$

INS. INS. ST. ST.

4) ↗

5) per $\Theta = 0$, $\Theta = \pi$ $\vec{\Phi}_c$ indet.

$\vec{\Phi}_O(0; 2mg + 3mg\cos\Theta e - \Phi_c) \rightarrow$ indet.

per $\Theta = \pm\frac{\pi}{3}$ $\vec{\Phi}_c = -\frac{mg}{2}\vec{j}$

$\vec{\Phi}_O = 4mg\vec{j}$

$\begin{cases} \vec{\Phi}_O = 5mg - \Phi_c & \Theta = 0 \\ \vec{\Phi}_O = -mg - \Phi_c & \Theta = \pi \end{cases}$

6) $T = \frac{1}{2} m e \left[\frac{L^2}{3}\dot{\Theta}^2 + \frac{L^2}{12}\dot{\Theta}^2 + L^2\dot{\Theta}^2\left(\frac{1}{4} + 2\cos^2\Theta\right)\right]$

$= \frac{1}{2} m L^2 \dot{\Theta}^2 \left[\frac{2}{3} + 2\cos^2\Theta\right] = m e l^2 \dot{\Theta}^2 \left(\frac{1}{3} + \cos^2\Theta\right)$

4) $V(\Theta) = \frac{3}{2} mgL(\cos^2\Theta - \cos\Theta)$

$\Theta = 0$, $\Theta = \pi$ max → selle

$\Theta = \pm\frac{\pi}{3}$ min → centri