MR 2010

TEMI D'ESAME - SOLUZIONI

16.06.2010 - FILA 1

Es. 1

1) $\ell = \frac{R}{3} s$

2) $s = \frac{3}{10} m/R^2$

$\ell = \frac{1}{10} m/R$

3) $I_{EF} = \frac{22}{15} m R^2$

Es. 2

1) $\theta_e = \pi/6$

2) $\bar{\Phi}_A = mg \frac{\sqrt{3}}{2} \vec{i}$

$\bar{\Phi}_N = \frac{mg}{2} \vec{j}$

$\Phi_B = \frac{5}{4} mg \vec{j}$

3) $\bar{\Phi}_H = \left(0, \frac{mg}{2}\right)$

Es. 3

1) $T = \frac{1}{2} m \left(\frac{4}{3} \dot{\theta}^2 + \dot{\varphi}^2\right)$

2) $\mathcal{L} = T + U$ dove

$U = mgR\left(\frac{3}{2}\cos\varphi + \sin\theta\cos\varphi - \sin^2\theta\right) + C$

3) $T + V = E$, $V = -U$, $E = T_0 + V_0$.

Il vincolo è fisso e bilatero, e forze conservative.

07.07.2010 - FILA 1 - CIVILT & AMBLT

Es. 1

1) $l = \frac{R}{21} s$

2) $s = \frac{7}{16} m/R^2$

$l = \frac{1}{48} m/R$

3) $I_{\Delta P} = \frac{31}{36} mR^2$

Es. 2

1) $(2L, 0)$; $(2L, \pi)$

2) non ci sono posizioni di confine di equilibrio

3) $(2L, 0)$ stabile

$(2L, \pi)$ instabile.

Es. 3

1) $T = \frac{3}{4} m R^2 \dot{\theta}^2 + \frac{8}{3} m R^2 \dot{\varphi}^2$

2) $U = 2mgR\cos\varphi + 2mgR\theta - \frac{1}{2} mg/R \left(R^2\theta^2 - 8R^2\theta \sin\varphi + \right.$

$\left. + 8Rc \sin\varphi + 2R\theta c \right) + \text{costante}$

dove ie ho θ ho coordinate $(R\theta + c, R)$

3) $\frac{3}{2} R^2 \ddot{\theta} - 2mgR + g(R\theta - 4l\sin\varphi + c) = 0$

$\frac{16}{3} R^2 \ddot{\varphi} + 2gR \sin\varphi + g(4R\theta\cos\varphi - 4R\sin\varphi - 4c\cos\varphi) = 0$

4) $\vec{\Phi}_c(t) = mR\ddot{\theta} + mg(\theta - 4\sin\varphi - 1 + \frac{c}{R})\vec{i} +$

$mg(2 + 4\cos\varphi)\vec{j}$

07.09.2010 - FILA 1

Es. 1

1). $y_G = \frac{(15\pi^2 + 28)}{21\pi} R$

2) $I_x = \frac{(16\pi^2 + 45)}{84} m R^2$

Es. 2

1) $\alpha = 2 \rightarrow s = 0 \Rightarrow (0, \frac{\pi}{2})$

2) $\bar{\Phi}_P = -2mg\,\vec{i}$

3) $\bar{\Phi}_Q = \Phi_Q \vec{n} = -2mg\,\vec{u}$ $\vec{u}$ normale all'arco AB in Q.

Es. 3

1) $G(6R\sin\theta, -6R\cos\theta)$

2) $T = \frac{1}{2} m \cdot 9R^2 (2\sin^2\theta + \frac{11}{6}) \dot{\theta}^2$

3) $\mathcal{L} = T + U$ dove

$U = \frac{15}{2} mgR\cos\theta + C$