PAUTA - PUNTAJE

C2 - P2

(a)

$$N(\theta) = mg - k l_0 (1 - \cos\theta)$$ $\boxed{1{,}0}$

$$mg \geq k l_0$$ $\boxed{1{,}0}$

(b)

$$W(\vec{f}_r)_{\theta=0 \to \theta=\frac{\pi}{4}} = \frac{1}{2} k l_0^2 (\sqrt{2}-1)^2 - \frac{1}{2} m v_0^2$$ $\boxed{2{,}0}$

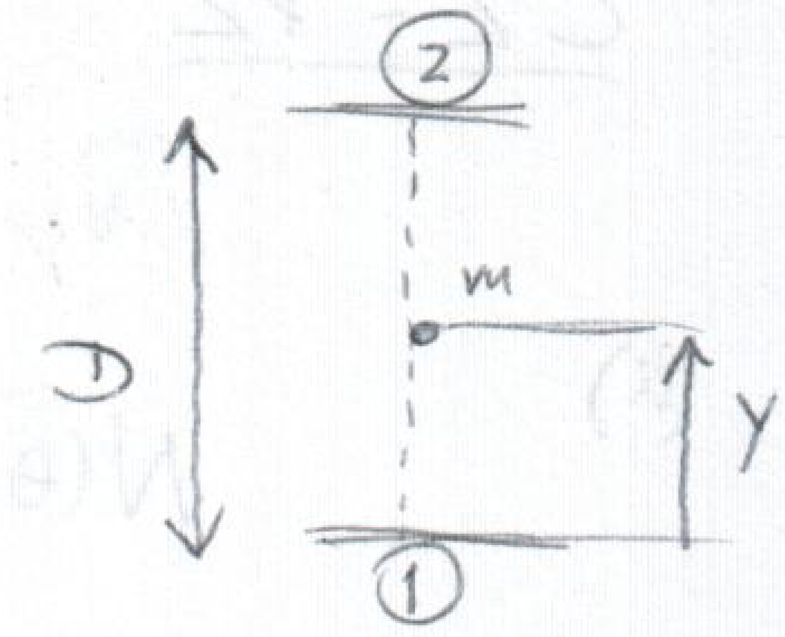
(c)

$$W(\vec{f}_r)_{\theta=0 \to \theta=\frac{\pi}{4}} = -\mu l_0 \int_0^{\pi/4} N(\theta) \sec^2\theta \, d\theta$$ $\boxed{1{,}5}$

$$\mu = \frac{\frac{1}{2} k l_0^2 (\sqrt{2}-1)^2 - \frac{1}{2} m v_0^2}{-l_0 \int_0^{\pi/4} N(\theta) \sec^2\theta \, d\theta}$$ $\boxed{0{,}5}$

PAUTA - PUNTAJE

C2 - P3



$$\left.\begin{array}{l} F_1 \longrightarrow U_1 = \dfrac{C}{r} \\ F_2 \longrightarrow U_2 = \dfrac{2C}{r} \end{array}\right\} \Rightarrow U_{TOTAL}(y) = U_1(y) + U_2(D-y) = \frac{C}{y} + \frac{2C}{D-y} \quad \boxed{1,0}$$

$$E_{MT}(y, \dot{y}) = \frac{1}{2} m \dot{y}^2 + \frac{C}{y} + \frac{2C}{D-y}$$

$$E_{MT}\left(\frac{D}{2}, v_0\right) = \frac{1}{2} m v_0^2 + \frac{6C}{D} \quad \boxed{1,0}$$

La E_{MT} se conserva, entonces

$$E_{MT}(y, \dot{y}) = E_{MT}\left(\frac{D}{2}, v_0\right)$$

La distancia mínima y_{min} a los centros de fuerza se alcanzan con $\dot{y}(y_{min}) = 0$ $\boxed{1,0}$

$$\Rightarrow E_{MT}(y_{min}, 0) = E_{MT}\left(\frac{D}{2}, v_0\right)$$

$$\Rightarrow \frac{1}{2} m v_0^2 + \frac{6C}{D} = \frac{C}{y_{min}} + \frac{2C}{D - y_{min}} \quad \boxed{1,0}$$

Pto. de equilibrio: (y_e)

$$\frac{d\,U_{TOTAL}}{dy}(y_e) = 0 \Longrightarrow y_e = (\sqrt{2} - 1) D \quad \boxed{1,0}$$

(éste es el equilibrio estable entre los centros de fuerza)

$$\Rightarrow \frac{d^2 U_{TOTAL}}{dy^2}\left(y_e = (\sqrt{2}-1)D\right) = \frac{2C}{D^3}\left[\frac{1}{(\sqrt{2}-1)^3} + \frac{2}{(2-\sqrt{2})^3}\right] \equiv A$$

$$\Rightarrow \omega_{pos}^2 = \frac{A}{m} \quad \vee \quad T_{pos} = 2\pi \sqrt{\frac{m}{A}}$$

$\boxed{1,0}$