Göran Karlsson

KTH Mekanik

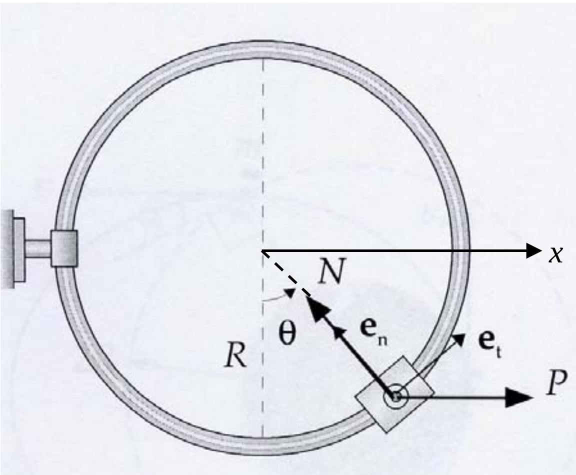
Läsåret 05/06

Kontrollskrivning nr F – KS F – 2006-0x-yz

5C1106 Tillämpad fysik, mekanik, 4 poäng

Lösningar

11.



a) Lagen om kinetiska energin

$U_{0\text{-}\pi/2} = T_{\pi/2} - T_0$

$$U_{0-\pi/2} = \int_0^R P\mathbf{e}_x \bullet dr\mathbf{e}_x = PR$$

$$PR = \frac{1}{2}mv^2 \quad \boxed{v = \sqrt{2PR/m}}$$

b) $U_{0\text{-}\theta} = T_\theta - T_0$

$$U_{0-\theta} = \int_0^{R\sin\theta} P\mathbf{e}_x \bullet dr\mathbf{e}_x = PR\sin\theta$$

$$PR\sin\theta = \frac{1}{2}mv^2 \quad \boxed{v = \sqrt{2\sin\theta/m}}$$

c) NII ger

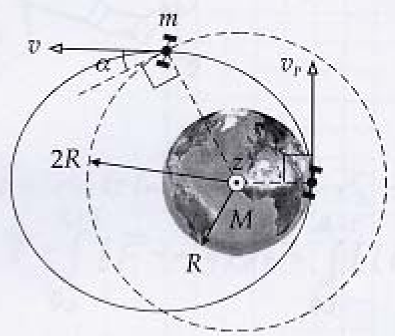
$$F_t = m\ddot{s}$$

$$F_n = m\frac{\dot{s}^2}{\rho} = m\frac{v^2}{R} \Rightarrow N - P\sin\theta = m\frac{v^2}{R}$$

b) ger $N = P\sin\theta + 2P\sin\theta$ $\quad \boxed{N = 3P\sin\theta}$

VÄND!

12.



$$\left.\begin{array}{lll} F_n = m\dfrac{\dot{s}^2}{\rho} \quad \text{för cirkelbanan} & \Rightarrow & \dfrac{mgR^2}{(2R)^2} = m\dfrac{v^2}{2R} \\ H_z = \text{konst} & \Rightarrow & 2R\cdot mv\cos\alpha = R\cdot mv_P \\ T + V = \text{konst} & \Rightarrow & \dfrac{1}{2}mv^2 - \dfrac{mgR^2}{2R} = \dfrac{1}{2}mv_P{}^2 - \dfrac{mgR^2}{R} \end{array}\right\}$$

Ekv. 1 $\Rightarrow$ $v^2 = \dfrac{gR}{2}$

Ekv. 2 $\Rightarrow$ $v_P{}^2 = (2v\cos\alpha)^2 = 4\dfrac{gR}{2}\cos^2\alpha = 2gR\cos^2\alpha$

Ekv. 3 $\Rightarrow$ $\dfrac{gR}{2} - gR = 2gR\cos^2\alpha - 2gR$

$$\frac{3}{2} = 2\cos^2\alpha$$

$$\cos\alpha = \pm\frac{\sqrt{3}}{2}$$

$\Rightarrow$ $\alpha = \pm 30^\circ$ och $\pm 150^\circ$

Dvs $\underline{\underline{\alpha_{max} = 30^\circ}}$

Ur detta ser vi att

a) $\boxed{v = \sqrt{gR/2}}$

b) $\boxed{\alpha_{max} = 30^o}$

GK