Λύσεις κριτηρίου 9

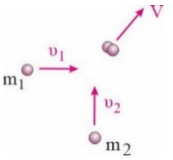
ΘΕΜΑ Α

Α1. (α) **Α2.** (β) **Α3.** (γ) **Α4.** (δ) **Α5.** α. Σ β. Λ γ. Σ δ. Λ ε. Σ

ΘΕΜΑ Β

Β1. **(ii)**

$$K_1 = K_2 = K = \frac{1}{2}m_1\upsilon_1^2 = \frac{p_1^2}{2m_1} \Rightarrow p_1^2 = 2Km_1 \quad , \quad p_2^2 = 2Km_2$$



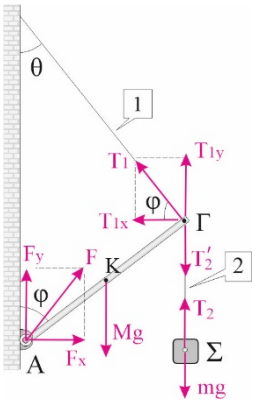
$$\text{ΑΔΟ: } P_{αρχ} = P_{τελ} \Rightarrow \sqrt{p_1^2 + p_2^2} = (m_1 + m_2)V \Rightarrow$$

$$2Km_1 + 2Km_2 = (m_1 + m_2)^2 V^2 \Rightarrow$$

$$K_{τελ} = \frac{1}{2}(m_1 + m_2)V^2 = K$$

$$\pi\% = \frac{K_{αρχ} - K_{τελ}}{K_{αρχ}}100\% = \frac{2K - K}{2K}100\% \Rightarrow \pi\% = 50\%$$

Β2. **(i)**



$$\Sigma F_{y,\Sigma} = 0 \Rightarrow w_2 = T_2 = mg$$

$$\Sigma\tau_{(A)} = 0 \Rightarrow T_1 L = Mg\frac{L}{2}\eta\mu\varphi + mgL\eta\mu\varphi \Rightarrow T_1 = 0,4Mg + 0,8mg \quad (1)$$

$$\Sigma F_x = 0 \Rightarrow F_x = T_{1x} \quad , \quad F = T_1 \Rightarrow \sqrt{F_x^2 + F_y^2} = \sqrt{T_{1x}^2 + T_{1y}^2} \Rightarrow F_y = T_{1y}$$

$$\Sigma F_y = 0 \Rightarrow F_y + T_{1y} = Mg + mg \Rightarrow 2T_1\eta\mu\varphi = Mg + mg \quad (2)$$

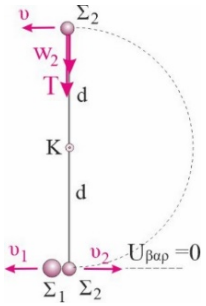
Από τις σχέσεις (1) και (2)

$$2(0,4Mg + 0,8mg)\eta\mu\varphi = Mg + mg \Rightarrow 0,64Mg + 1,28mg = Mg + mg \Rightarrow 9M = 7m$$

Β3. **(i)**

Οριακή ανακύκλωση: Τ=0 ,

$$F_κ = w_2 \Rightarrow m_2 g = \frac{m_2\upsilon^2}{d} \Rightarrow \upsilon = \sqrt{gd}$$

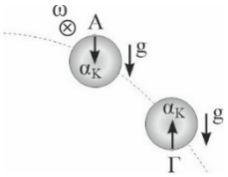


$$\text{ΑΔΜΕ}: \frac{1}{2}m_2\upsilon_{2}^{2} = \frac{1}{2}\ \ _2\upsilon^2 + \ \ _2 \Rightarrow \upsilon_{2} = \sqrt{\ \ }$$

$$\upsilon_2' = \frac{2m_1}{m_1+m_2}\upsilon_0 = \frac{6m_2}{3m_2+m_2}\upsilon_0 = \frac{3}{2}\upsilon_0 \quad , \quad L = m_2\upsilon d = \frac{m_1}{3}\frac{\upsilon_{2}}{\sqrt{5}}d = \frac{1}{3}\frac{\upsilon_0}{\sqrt{5}}d = = \frac{_1\upsilon_0\ \sqrt{\ }}{10}$$

ΘΕΜΑ Γ

Γ1.



$$\upsilon_0 = \omega R \Rightarrow \omega = 10\text{rad/s}$$

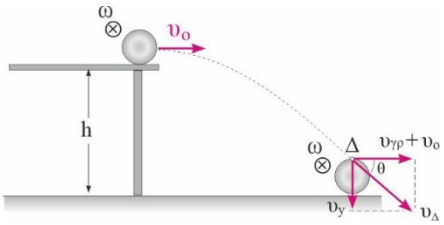
$$\alpha_{min} = \alpha_\Gamma = \alpha_\kappa - g = \frac{\upsilon_{\gamma\rho}^{\ 2}}{R} - g = \omega^2 R - g \Rightarrow \alpha_{min} = 0 \quad ,$$

$$\alpha_{max} = \alpha_A = \alpha_\kappa + g = \omega^2 R + g \Rightarrow \alpha_{max} = 20\text{m/s}^2$$

Γ2. $\theta = \omega t = 4\text{rad}$, $N = \frac{\theta}{2\pi} = \frac{2}{\pi}$ στροφές ,

$$h = \frac{1}{2}gt^2 \Rightarrow t = 0,4\text{s}$$

Γ 3 . $\upsilon_\Delta = \sqrt{\left(\upsilon_{\gamma\rho} + \upsilon_o\right)^2 + \upsilon_{y}^{\ 2}} \Rightarrow$



$$\upsilon_\Delta = \sqrt{\left(2\omega R\right)^2 + \left(gt\right)^2} \Rightarrow \upsilon_\Delta = 2\sqrt{5}\text{m/s}$$

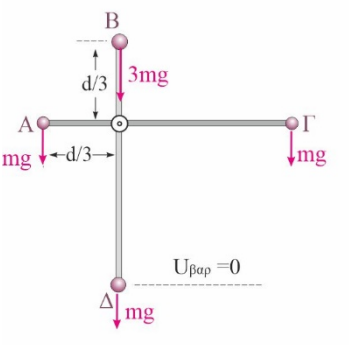
$$\varepsilon\varphi\theta = \frac{\upsilon_y}{2\upsilon_0} = 2 \Rightarrow \theta = 63^0$$

Γ4. $\frac{dU_B}{dt} = -\frac{dw_B}{dt} = -\frac{mgdy}{dt} = -mg\upsilon_y = -mg^2t \Rightarrow \frac{dU_B}{dt} = -2\text{J/s}$

ΘΕΜΑ Δ

Δ1. $\Sigma\tau_{A\Gamma(\kappa)} = mg\frac{2d}{3} - mg\frac{d}{3} = 1\text{Nm}$, $\Sigma\tau_{B\Delta(\kappa)} = 0$

Δ2. $\text{ΑΔΜΕ}:$



$$g\frac{2d}{3}+g\frac{2d}{3}=gd+\frac{1}{2}\left(\omega\frac{d}{3}\right)^2+\frac{1}{2}\left(\omega\frac{2d}{3}\right)^2\Rightarrow$$

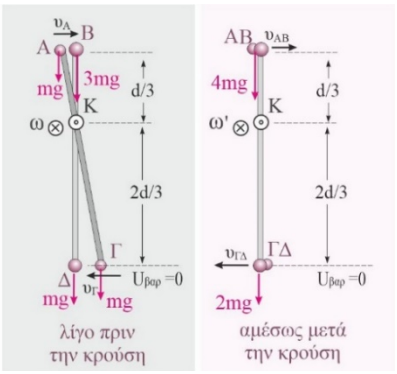
$$mg\frac{2d}{3}+mg\frac{2d}{3}=mgd+\frac{1}{2}m\upsilon_A{}^2+\frac{1}{2}m\upsilon_\Gamma{}^2\Rightarrow\ \omega=2\text{rad/s}\ ,\ \upsilon_\Gamma=\omega\frac{2d}{3}=4\text{m/s}$$

Δ3. $A\Delta\Sigma:$

$$m\upsilon_A\frac{d}{3}+m\upsilon_\Gamma\frac{2d}{3}=4m\upsilon_{AB}\frac{d}{3}+2m\upsilon_{\Gamma\Delta}\frac{2d}{3}\Rightarrow$$

$$m\omega\left(\frac{d}{3}\right)^2+m\omega\left(\frac{2d}{3}\right)^2=4m\omega\left(\frac{d}{3}\right)^2+\quad\omega\left(\frac{2d}{3}\right)^2\Rightarrow$$

$$\omega'=\frac{5}{12}\omega=\frac{5}{6}\text{rad/s}$$



Δ 4 .

$$Q=\frac{1}{2}m\upsilon_A{}^2+\frac{1}{2}m\upsilon_\Gamma{}^2-\left[\frac{1}{2}4m\upsilon_{AB}{}^2+\frac{1}{2}2m\upsilon_{\Gamma\Delta}{}^2\right]\Rightarrow$$

$$Q=\frac{1}{2}m\left(\omega\frac{d}{3}\right)^2+\frac{1}{2}m\left(\omega\frac{2d}{3}\right)^2-\frac{1}{2}4m\left(\omega\frac{d}{3}\right)^2-\frac{1}{2}\quad\left(\omega\frac{2d}{3}\right)^2\Rightarrow\quad=\frac{7}{12}$$

Δ5. $t=\frac{T}{2}=\frac{2\pi}{2\omega}=1,2\pi\text{s}$