ΦΡΟΝΤΙΣΤΗΡΙΑ σύγχρονο

ΑΠΑΝΤΗΣΕΙΣ ΣΤΗ ΦΥΣΙΚΗ ΠΡΟΣΑΝΑΤΟΛΙΣΜΟΥ 13 6 2018

Θέμα Α

Α1. γ

Α2. δ

Α3. α

Α4 δ

Α5. **α)** Λ

β) Σ

γ) Λ

δ) Σ

ε) Λ

Θέμα Β

Β1.

$$d_2=\sqrt{d_1^2+d^2}=\sqrt{4\lambda_1^2+\frac{9\lambda_1^2}{4}}=\frac{5\lambda_1}{2},\quad f_2=2f_1\Rightarrow\frac{u}{\lambda_2}=2\frac{u}{\lambda_1}\Rightarrow\lambda_2=\frac{\lambda_1}{2}$$

$$\mathrm{A}_\Sigma=\left|2\mathrm{A}\sigma\upsilon\nu 2\pi\frac{d_1-d_2}{2\lambda_2}\right|=\left|2\mathrm{A}\sigma\upsilon\nu 2\pi\frac{2\lambda_1-\frac{5\lambda_1}{2}}{2\frac{\lambda_1}{2}}\right|=\left|2\mathrm{A}\sigma\upsilon\nu(-\pi)\right|=2\mathrm{A}$$

Άρα σωστή είναι η (i)

Β2.

$$W_F=\frac{1}{2}I_2\omega_2^2-\frac{1}{2}I_1\omega_1^2=\frac{1}{2}m\frac{R^2}{4}\omega_2^2-\frac{1}{2}mR^2\omega_1^2\ (1)$$

$$L_{\alpha\rho\chi}=L_{\tau\varepsilon\lambda}\Rightarrow mu_1R=mu_2\frac{R}{2}\Rightarrow u_2=2u_1\Rightarrow\frac{R}{2}\omega_2=2R\cdot\omega_1\Rightarrow\omega_2=4\omega_1\ (2)$$

Από (1) και (2) : $W_F=\frac{1}{2}m\frac{R^2}{4}\cdot 16\omega_1^2-\frac{1}{2}mR^2\omega_1^2=\frac{3}{2}m\omega^2R^2$

Άρα σωστή είναι η (iii)

Β3.

$$\Pi_\Gamma = \Pi_\Delta \Rightarrow A_\Gamma u_\Gamma = A_\Delta u_\Delta \Rightarrow 2A_\Delta u_\Gamma = A_\Delta u_\Delta \Rightarrow u_\Delta = 2u_\Gamma \quad (1)$$

Bernouli από $\Gamma \rightarrow \Delta$: $P_\Gamma + \frac{1}{2} p u_\Gamma^{\,2} = P_\Delta + \frac{1}{2} p u_\Delta^{\,2} + p \cdot g \cdot h \Rightarrow P_\Gamma - P_\Delta = \frac{1}{2} p u_\Delta^{\,2} - \frac{1}{2} p u_\Gamma^{\,2} + p \cdot g \cdot h \overset{(1)}{\Rightarrow}$

$$P_\Gamma - P_\Delta = \frac{3p}{2} u_\Gamma^{\,2} + p \cdot g \cdot h \ (2)$$

$$ZK = u_\Delta \cdot t \overset{(1)}{\Rightarrow} 4h = 2u_\Gamma \sqrt{\frac{2h}{g}} \Rightarrow g \cdot h = \frac{u_\Gamma^{\,2}}{2} \quad (3)$$

Από (2) και (3) $P_\Gamma - P_\Delta = 2 p u_\Gamma^{\,2}$

Άρα σωστή είναι η (i)

Θέμα Γ

Γ1.

$$u_1 = \omega_1 \Delta\ell = \sqrt{\frac{k_1}{m_1}} \cdot \Delta\ell = \sqrt{\frac{50\,\mathrm{N/m}}{2kg}} \cdot 0,4 = 2\ m/s$$

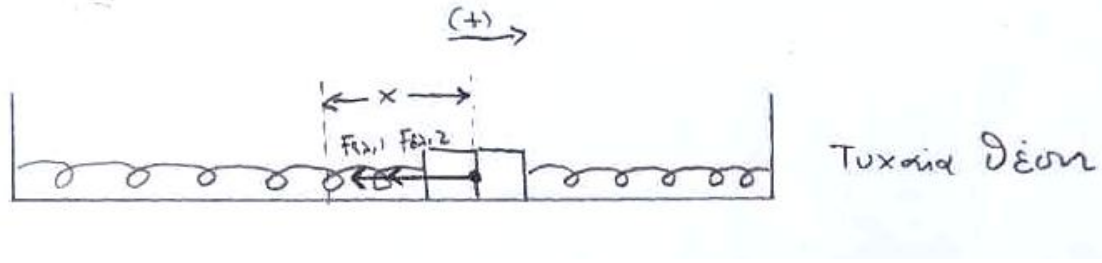
$$\overrightarrow{P_{o\lambda}} \pi\rho\iota\nu = \overrightarrow{P_{o\lambda}} \mu\varepsilon\tau\acute{\alpha} \Rightarrow m_1 u_1 = (m_1 + m_2) u_{\sigma\upsilon\sigma} \Rightarrow u_{\sigma\upsilon\sigma} = \frac{m_1 u_1}{m_1 + m_2} = \frac{2kg \cdot 2\,m/s}{4kg} = 1 m/s$$

$$\frac{f_1}{f_2} = \frac{\frac{u_{nx} - u_1}{u_{nx}} f_s}{\frac{u_{nx} - u_{\sigma\upsilon\sigma}}{u_{nx}} f_s} = \frac{338}{339}$$

Γ2.

Στην τυχαία θέση: $\Sigma F = -F_{\varepsilon\lambda.1} - F_{\varepsilon\lambda.2} = -k_1 x - k_2 x \Rightarrow \Sigma F = -(k_1 + k_2) x$

Άρα αατ με $D = k_1 + k_2 = 2k$



$$E = K + U \Rightarrow \frac{1}{2} 2kA^2 = \frac{1}{2}(m_1 + m_2) u_{\sigma\upsilon\sigma}^{\,2} + 0 \Rightarrow A = \sqrt{\frac{\frac{1}{2}(m_1 + m_2) u_{\sigma\upsilon\sigma}^{\,2}}{k}} = \sqrt{\frac{\frac{1}{2} 4kg\,(1m/s)^2}{50\,N/m}} = 0,2m$$

Γ3. $t=\dfrac{T}{4}=\dfrac{2\pi\sqrt{\dfrac{m_1+m_2}{2k}}}{4}=\dfrac{2\pi\sqrt{\dfrac{4kg}{100\,N/m}}}{4}=\dfrac{\pi}{10}s\ \ \acute{\eta}\ \ 0,314s$

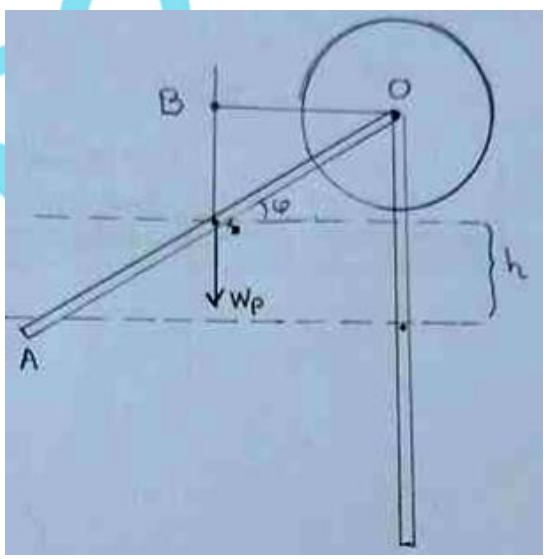
Γ4. $\left.\dfrac{dP}{dt}\right|_{\max}=\Sigma F_{\max}=2k\mathrm{A}=100\dfrac{\mathrm{N}}{m}0,2m=20N$

ΘΕΜΑ Δ

Δ1.

$$\mathrm{I}_{ολ}=\mathrm{I}_{\Delta}+\mathrm{I}_{\rho}=\frac{1}{2}m_{\Delta}{R_{\Delta}}^2+\left(\frac{1}{12}\mathrm{M}\ell^2+M\left(\frac{\ell}{2}\right)^2\right)=\frac{1}{2}m_{\Delta}{R_{\Delta}}^2+\frac{1}{3}\mathrm{M}\ell^2=\frac{1}{2}4kg\left(\frac{\sqrt{2}}{2}m\right)^2+\frac{1}{3}8kg\left(3m\right)^2=25kgm^2$$

Δ2. $\dfrac{dL}{dt}=\Sigma\tau=W_{\rho}\cdot\mathrm{OB}=Mg\dfrac{\ell}{2}\sigma\upsilon\nu\varphi=8kg10\dfrac{m}{s^2}\cdot\dfrac{3}{2}m\cdot0,6=72Nm$



Δ3.

$$\mathrm{E}_{μηχ.αρχ}=\mathrm{E}_{μηχ.τελ}\Rightarrow U_{αρχ}=\mathrm{K}_{τελ}\Rightarrow$$

$$\Rightarrow\mathrm{K}_{τελ}=M\cdot g\cdot h=Mg\left(\frac{\ell}{2}-\frac{\ell}{2}ημφ\right)=$$

$$=M\cdot g\frac{\ell}{2}\left(1-ημφ\right)=8kg\cdot10\frac{m}{s^2}\cdot\frac{3}{2}\cdot0,2m=24J$$

Δ4. Για τον κύλινδρο:

$$\left.\begin{aligned}\Sigma F=m\alpha_{cm}\Rightarrow mgημφ-\mathrm{T}-J=m\alpha_{cm}\\ \Sigma\tau=\mathrm{I}_{\kappa}\alpha_{γων,\kappa}\Rightarrow J\cdot R-T\cdot R=\frac{1}{2}\mathrm{M}R^2\cdot\alpha_{γων,\kappa}\Rightarrow J-T=\frac{1}{2}m\alpha_{cm}\end{aligned}\right\}\Rightarrow mgημφ-2T=\frac{3}{2}m\alpha_{cm}\quad(1)$$

Για την τροχαλία:

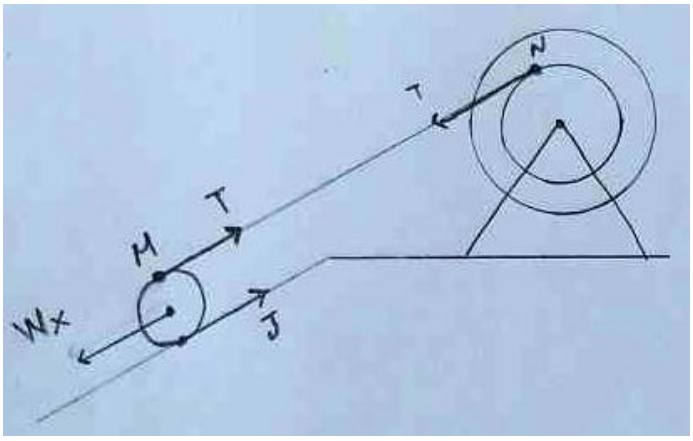
$$\Sigma\tau=\mathrm{I}_{τρ}\alpha_{γων,τρ}\Rightarrow T\cdot R=\mathrm{I}_{τρ}\cdot\alpha_{γων,τρ}$$

$$u_M=u_N\Rightarrow2u_{cm}=\omega_{τρ}\cdot R\Rightarrow$$

Επίσης:

$$\Rightarrow2\alpha_{cm}=\alpha_{γων,τρ}R\Rightarrow\alpha_{γων,τρ}=2\frac{\alpha_{cm}}{R}$$

Άρα $T\cdot R=\mathrm{I}_{τρ}\dfrac{2\alpha_{cm}}{R}\Rightarrow T=\mathrm{I}_{τρ}\dfrac{2\alpha_{cm}}{R^2}\quad(2)$



Από (1), (2):

$$mg\eta\mu\varphi - 2\mathrm{I}_{\tau\rho}\frac{2\alpha_{cm}}{R^2} = \frac{3}{2}m\alpha_{cm} \Rightarrow \alpha_{cm} = \frac{mg\eta\mu\varphi}{\frac{3}{2}m + 4\frac{\mathrm{I}_{\tau\rho}}{R^2}} = 1m/s^2$$

$$\left.\begin{array}{l} S = \frac{1}{2}a_{cm}\cdot t^2 \Rightarrow t = \sqrt{\frac{2S}{a_{cm}}} \\ u = a_{cm}\cdot t \end{array}\right\} \Rightarrow u = \sqrt{2Sa_{cm}} = 2m/s$$

ΕΠΙΜΕΛΕΙΑ:
Μ. ΟΙΚΟΝΟΜΑΚΗΣ