ΠΑΝΕΛΛΑΔΙΚΕΣ ΕΞΕΤΑΣΕΙΣ
Γ' ΤΑΞΗΣ ΗΜΕΡΗΣΙΟΥ ΓΕΝΙΚΟΥ ΛΥΚΕΙΟΥ
ΤΕΤΑΡΤΗ 13 ΙΟΥΝΙΟΥ 2018
ΕΞΕΤΑΖΟΜΕΝΟ ΜΑΘΗΜΑ:
ΦΥΣΙΚΗ ΠΡΟΣΑΝΑΤΟΛΙΣΜΟΥ

ΕΝΔΕΙΚΤΙΚΕΣ ΑΠΑΝΤΗΣΕΙΣ ΘΕΜΑΤΩΝ

ΘΕΜΑ Α

Α1. γ

Α2. δ

Α3. α

Α4. δ

Α5. **α)** Λάθος **β)** Σωστό **γ)** Λάθος **δ)** Σωστό **ε)** Λάθος

ΘΕΜΑ Β

Β1. $d_2 = \sqrt{4\lambda_1^2 + \dfrac{9\lambda_1^2}{4}} = \sqrt{\dfrac{25\lambda_1^2}{4}} = \dfrac{5\lambda_1}{2} = 2{,}5\lambda_1$

$d_2 - d_1 = 2{,}5\lambda_1 - \lambda_1 = \dfrac{\lambda_1}{2}$

$\upsilon\delta = \lambda_1 \cdot f_1 = \lambda_2 \cdot f_2 \rightarrow \lambda_1 \cdot \cancel{f_1} = \lambda_2 \cdot \cancel{f_2} \rightarrow \lambda_2 = \dfrac{\lambda_1}{2}$

$A' = \left|2A\sigma\upsilon\nu\pi\dfrac{d_2 - d_1}{\lambda_2}\right| = \left|2A\sigma\upsilon\nu\pi\dfrac{\frac{\lambda_1}{2}}{\frac{\lambda_1}{2}}\right| = 2A$

Επιλέγω (i)

Β2. $\Sigma\vec{\tau}_{\varepsilon\xi} = 0 \rightarrow \vec{L}_1 = \vec{L}_2 \rightarrow m\upsilon_1 R = m\upsilon_1 \dfrac{R}{2} \rightarrow \upsilon_2 = 2\upsilon_1$

$$\begin{aligned} W_F = K_2 - K_1 &= \frac{1}{2}m\upsilon_2^2 - \frac{1}{2}m\upsilon_1^2 \\ &= \frac{1}{2}m\left(4\upsilon_1^2 - \upsilon_1^2\right) \\ &= \frac{3}{2}m\upsilon_1^2 \\ &= \frac{3}{2}m\upsilon\omega^2R^2 \end{aligned}$$

Επιλέγω (iii)

Β3. $x = \upsilon_\Delta \cdot t$

$$4h = \upsilon_\Delta \cdot \sqrt{\frac{2h}{g}} \rightarrow \cancel{16}^{8} h^{\cancel{2}} = \upsilon_\Delta^2 \cdot \frac{\cancel{2}\cancel{h}}{g} \rightarrow \upsilon_\Delta = \sqrt{8gh}$$

<u>Εξ. συνέχειας:</u>

$$\Pi_\Gamma = \Pi_\Delta \rightarrow A_\Gamma \cdot U_\Gamma = A_\Delta \cdot U_\Delta \rightarrow 2A\Delta \cdot U_\Gamma = A_\Delta \cdot U_\Delta$$

$$\rightarrow U_\Delta = 2U_\Gamma \rightarrow \sqrt{8gh} = 2U_\Gamma$$

$$8gh = 4U_\Gamma^2$$

$$gh = \frac{U_\Gamma^2}{2}$$

<u>Εξ. Bernoulli:</u>

$$P_\Gamma + \frac{1}{2}pU_\Gamma^2 = P_\Delta + \frac{1}{2}pU_\Delta^2 + pgh$$

$$P_\Gamma - P_\Delta = \frac{1}{2}pU_\Delta^2 - \frac{1}{2}pU_\Gamma^2 + pgh$$

$$= \frac{1}{2}p4U_\Gamma^2 - \frac{1}{2}pU_\Gamma^2 + p \cdot \frac{U_\Gamma^2}{2}$$

$$= 2pU_\Gamma^2$$

Επιλέγω (i)

ΘΕΜΑ Γ

Γ1. $\upsilon_1 = \upsilon_{max} = \omega_1 \cdot A_1$

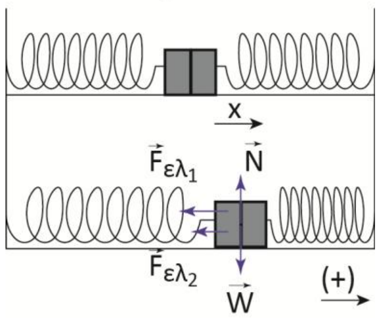
$$= \sqrt{\frac{K_1}{m_1}} \cdot \Delta\ell = 5 \cdot 0{,}4 = 2\ m/sec$$

ΑΟΔ $\vec{P}_{\alpha\rho\chi} = \vec{P}_{\tau\varepsilon\lambda} \rightarrow m_1 \cdot \upsilon_1 = (m_1 + m_2) \cdot \upsilon_2$

$$V_\Sigma = \frac{\upsilon_1}{2} = 1m/sec$$

$$\left.\begin{aligned} f_1 &= \frac{\upsilon_{\eta\chi} - \upsilon_1}{\upsilon_{\eta\chi}} \cdot f_1 \\ f_2 &= \frac{\upsilon_{\eta\chi} - \upsilon_\Sigma}{\upsilon_{\eta\chi}} \cdot f_2 \end{aligned}\right\} \frac{f_1}{f_2} = \frac{\upsilon_{\eta\chi} - \upsilon_1}{\upsilon_{\eta\chi} - \upsilon_\Sigma} = \frac{338}{339}$$

Γ2.



Στη Θ.Ι. ΣF=0 (Θ.Φ.Μ)

Σε τυχαία θέση που απέχει x από τη Θ.Ι

$\Sigma F = -F_{ελ_1} - F_{ελ_2}$

$\Sigma F = -k_1 \cdot x - k_2 \cdot x$

$\Sigma F = -(k_1 + k_2) \cdot x$

$\Sigma F = -2k \cdot x$

Άρα εκτελεί απλή αρμονική ταλάντωση με $D = 2k = 100 N/m$.

Θ.Ι $\quad V_\Sigma = \upsilon_{max} \rightarrow V_\Sigma = \omega \cdot A \rightarrow V_\Sigma = \sqrt{\dfrac{D}{m_1 + m_2}} \cdot A \rightarrow A = 0{,}2m$

Γ3. Όταν $\upsilon_A = 0$ δηλαδή όταν $x = +A$ για $1^η$ φορά $f_A = f_s$

Αυτό θα συμβεί $\Delta t = \dfrac{T}{4}$ μετά την κρούση (Θ.Ι)

$T = 2\pi\sqrt{\dfrac{m_1 + m_2}{D}} = 0{,}4\pi \ \sec$

$\Delta t = \dfrac{T}{4} = 0{,}1\pi \ \sec$

Γ4. $\dfrac{\Delta P}{\Delta t} = \Sigma F = -D \cdot x$

$\left|\dfrac{\Delta P}{\Delta t}max\right| = D \cdot A$

$= 100 \cdot 0{,}2$

$= 20 \ kg \, m/\sec^2$

ΘΕΜΑ Δ

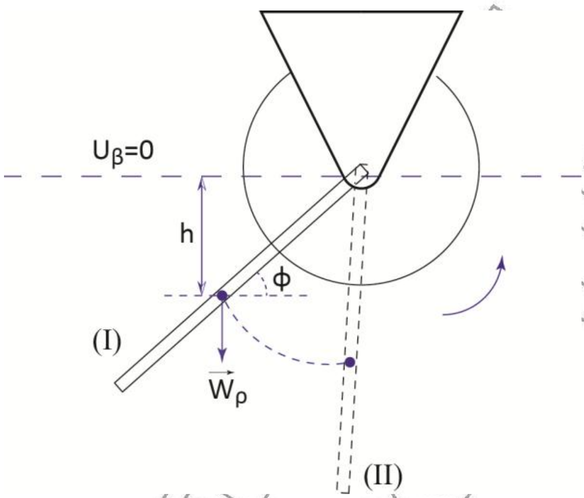
Δ1. Steiner: $$I_{\rho}^{(0)} = I_{cm} + M\left(\frac{\ell}{2}\right)^2 = \frac{1}{12}M\ell^2 + \frac{M\ell^2}{4} = \frac{1}{3}M\ell^2$$

$$I_{\rho-\Delta}^{(0)} = I_{\rho}^{(0)} + I_{1}^{(0)} = \frac{1}{3}M\ell^2 + \frac{1}{2}m_{\Delta}R_{\Delta}^2$$
$$= (24+1)\,kgm^2$$
$$= 25kgm^2$$

Δ2. $$\frac{\Delta \vec{L}}{\Delta t}(\rho-\Delta) = \vec{\Sigma}\tau\varepsilon\xi \rightarrow$$

$$\frac{\Delta L}{\Delta t}(\rho-\Delta) = W\rho\cdot\frac{\ell}{2}\cdot\sigma\upsilon\nu\phi$$
$$= Mg\cdot\frac{\ell}{2}\cdot\sigma\upsilon\nu\phi$$
$$= 72kg\ m^2/sec^2$$

Δ3.



ΑΔΜΕ (I) $\rightarrow$ (II)

$$k_{\alpha\rho\chi} + U_{\alpha\rho\chi} = k_{\tau\varepsilon\lambda} + U_{\tau\varepsilon\lambda}$$

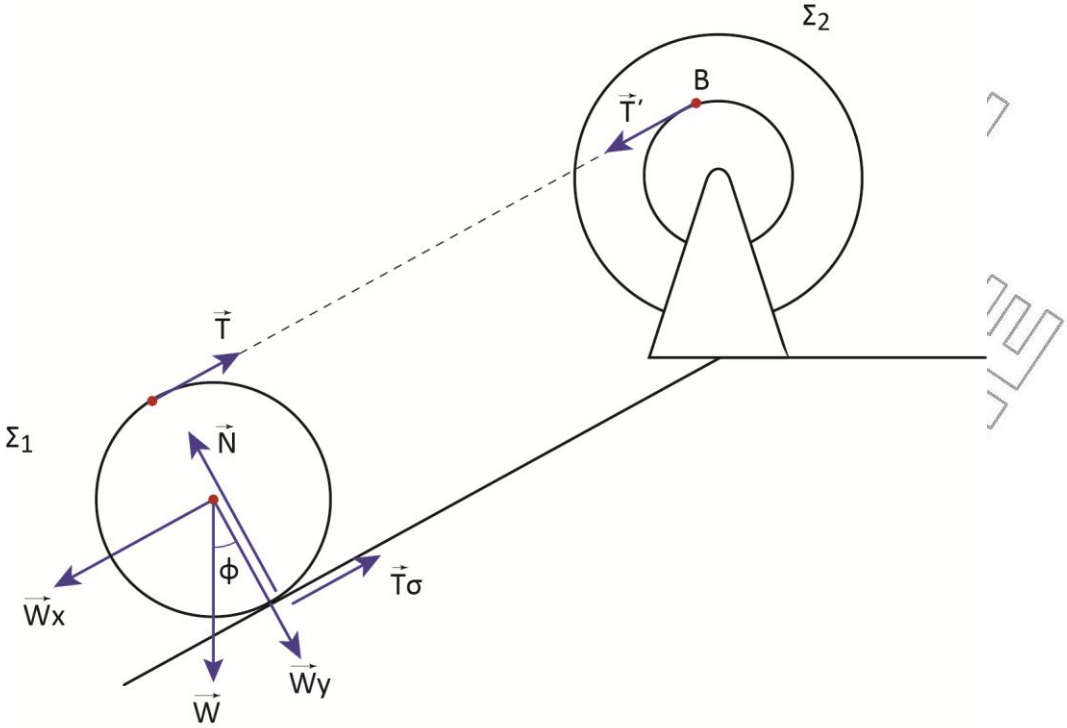
$$-Mgh = k_{\tau\varepsilon\lambda} - Mg\frac{\ell}{2}$$

$$k_{\tau\varepsilon\lambda} = Mg\frac{\ell}{2} - Mgh \qquad \text{όπου } h = \frac{\ell}{2}\eta\mu\phi$$

$$k_{\tau\varepsilon\lambda} = Mg\frac{\ell}{2}(1-\eta\mu\phi)$$

$$k_{\tau\varepsilon\lambda} = 24J$$

Δ4.



$\upsilon_{cm} = \omega_2 R \rightarrow$

$\boxed{\alpha_{cm} = \alpha_{\gamma\omega\nu_2} \cdot R}$

$\upsilon_A = 2\upsilon_{cm}$

$\upsilon_A = \upsilon_B$

$2\upsilon_{cm} = \upsilon_B$

$2\upsilon_{cm} = \omega_1 \cdot R$

$\boxed{2 \cdot \alpha_{cm} = \alpha_{\gamma\omega\nu_1} \cdot R}$

και T = T′ (αβαρές νήμα)

Σ1. $\Sigma\tau = I_{cm} \cdot \alpha_{\gamma\omega\nu_1} \rightarrow T \cdot R = I_{cm} \cdot \alpha_{\gamma\omega\nu_1}$

$$\rightarrow T = \frac{I_{cm}}{R} \cdot \alpha_{\gamma\omega\nu_1} \quad (1)$$

Σ2.

$$\left.\begin{aligned} &\Sigma Fx = m \cdot \alpha_{cm} \rightarrow Wx - T - T\sigma = m\alpha_{cm} \\ &\Sigma\tau = I_k \cdot \alpha_{\gamma\omega\nu_2} \rightarrow T\sigma \cdot \cancel{R} - T \cdot \cancel{R} = \frac{1}{2} m R^{\cancel{2}} \cdot \frac{\alpha_{cm}}{\cancel{R}} \end{aligned}\right\} \xrightarrow{(+)}$$

$$\rightarrow Wx - 2T = \frac{3}{2} m\alpha_{cm}$$

$$\xrightarrow{(1)} mg\eta\mu\varphi - 2\cdot\frac{I_{cm}}{R}\cdot\alpha_{\gamma\omega\nu_1} = \frac{3}{2} m\alpha_{cm}$$

$$\rightarrow mg\eta\mu\varphi - 2\cdot\frac{I}{R}\cdot\frac{2\alpha_{cm}}{R} = \frac{3}{2} m\alpha_{cm}$$

$$\rightarrow \alpha_{cm} = 1\ m/sec^2$$

$$\left.\begin{aligned} &\upsilon_{cm} = \alpha_{cm}\cdot t \rightarrow t = \frac{\upsilon_{cm}}{\alpha_{cm}} \\ &S = \frac{1}{2}\alpha_{cm}\cdot t^2 \end{aligned}\right\} \quad S = \frac{1}{2}\cancel{\alpha_{cm}}\cdot\frac{\upsilon_{cm^2}}{\alpha_{cm^{\cancel{2}}}}$$

$$\upsilon_{cm} = \sqrt{2\alpha_{cm}\cdot S} = 2\ m/sec$$

ΚΑΛΑ ΑΠΟΤΕΛΕΣΜΑΤΑ!!!