ΠΑΝΕΛΛΑΔΙΚΕΣ ΕΞΕΤΑΣΕΙΣ
Γ΄ ΤΑΞΗΣ ΗΜΕΡΗΣΙΟΥ ΓΕΝΙΚΟΥ ΛΥΚΕΊΟΥ
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ΕΞΕΤΑΖΟΜΕΝΟ ΜΑΘΗΜΑ:
ΦΥΣΙΚΗ ΠΡΟΣΑΝΑΤΟΛΙΣΜΟΥ
ΠΑΛΑΙΟ ΣΥΣΤΗΜΑ
(Ενδεικτικές Απαντήσεις)

ΘΕΜΑ Α

Α1 $\rightarrow$β

Α2 $\rightarrow$γ

Α3 $\rightarrow$α

Α4 $\rightarrow$α

Α5. **α** $\rightarrow$ Σωστό
β $\rightarrow$ Λάθος
γ $\rightarrow$ Λάθος
δ $\rightarrow$ Λάθος
ε $\rightarrow$ Σωστό

ΘΕΜΑ Β

Β1. Η σωστή απάντηση **είναι το ii**

$$\left.\begin{aligned} p_1 &= p_{\alpha\tau\mu} + \frac{F}{A_1} \\ p_2 &= p_{\alpha\tau\mu} + \frac{w}{A_2} + \rho \cdot g \cdot h \end{aligned}\right\} \xrightarrow{p_1 = p_2}$$

$$\rho \cdot g \cdot h + \frac{w}{A_2} = \frac{F}{A_1} \Rightarrow$$

$$\frac{F}{A_1} = \frac{w + \rho \cdot g \cdot h \cdot A_2}{A_2}$$

B2. Η σωστή απάντηση **είναι το ii.**

Ενίσχυση: $r_\beta - r_A = \kappa\lambda \overset{r_\beta - r_A = 2x_1}{\Rightarrow} 2x_1 = \kappa\lambda (1)$

Απόσβεση:

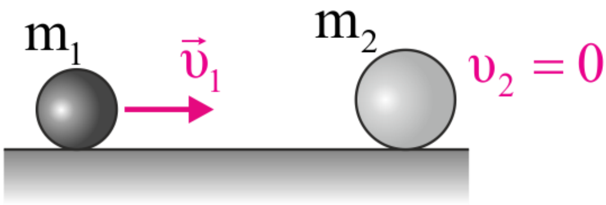
$$r_\beta' - r_A = (2\kappa+1)\frac{\lambda}{2} \overset{r_\beta' - r_A = 2(x_1+4)}{\Rightarrow} 2(x_1+4) = (2\kappa+1)\frac{\lambda}{2} (2)$$

$$(2)-(1): \quad \frac{\lambda}{2} = 8cm \Rightarrow \boxed{\lambda = 16cm}$$

B3.

α) Η σωστή απάντηση **είναι το iii.**

β) Ελαστική μετωπική κρούση με $\upsilon_2 = 0$.



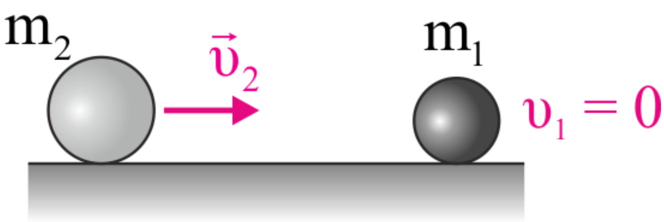
$$\upsilon_1' = \frac{m_1 - m_2}{m_1 + m_2} \cdot \upsilon_1$$

$$\Pi_1 = \frac{\Delta K_1}{K_1} \cdot 100\% = \left(\frac{K_1'}{K_1} - 1\right) \cdot 100\%$$

$$= \left(\frac{\frac{1}{2} m_1 \left(\frac{m_1 - m_2}{m_1 + m_2} \cdot \upsilon_1\right)^2}{\frac{1}{2} m_1 \upsilon_1^2} - 1\right) \cdot 100\% \Rightarrow$$

$$\Pi_1 = \left(\left(\frac{m_1 - m_2}{m_1 + m_2}\right)^2 - 1\right) \cdot 100\% \quad (1)$$

Ελαστική μετωπική κρούση με $\upsilon_1 = 0$.



$$\upsilon_2' = \frac{m_2 - m_1}{m_1 + m_2} \cdot \upsilon_2$$

$$\Pi_2 = \frac{\Delta K_2}{K_2} \cdot 100\% = \left(\frac{K_2'}{K_2} - 1\right) 100\%$$

$$= \left(\frac{\frac{1}{2} m_2 \left(\frac{m_2 - m_1}{m_1 + m_2} \cdot \upsilon_2\right)^2}{\frac{1}{2} m_1 \upsilon_2^2} - 1\right) 100\% \Rightarrow$$

$$\Pi_2 = \left(\left(\frac{m_2 - m_1}{m_1 + m_2}\right)^2 - 1\right) \cdot 100\% \quad (2)$$

Άρα από (1) και (2) προκύπτει $\Pi_1 = \Pi_2$.

<u>ΘΕΜΑ Γ</u>

Γ1. <u>ΘΜΚΕ για το Σ2</u>

$$\mathrm{K}_{\tau\varepsilon\lambda} - \mathrm{K}_{\alpha\rho\chi} = W_{w_2} \Rightarrow \frac{1}{2} \cdot m_2 \cdot u_2^2 = m_2 \cdot g \cdot h \Rightarrow$$

$$u_2 = \sqrt{2 \cdot g \cdot h} \Rightarrow$$

$$u_2 = 2\sqrt{3}\,\frac{m}{s}$$

<u>ΑΔΟ x΄x</u>

$$\vec{P}_{x'x,\pi\rho\iota\nu} = \vec{P}_{x'x,\mu\varepsilon\tau\acute{\alpha}} \Rightarrow m_2 \cdot u_2 \cdot \eta\mu\varphi = (m_2 + m_1) \cdot u_K \Rightarrow$$

$$3 \cdot 2\sqrt{3} \cdot \frac{1}{2} = 4 \cdot u_K \Rightarrow$$

$$u_K = \frac{3\sqrt{3}}{4}\frac{m}{s}$$

Γ2.

<u>Θ.Ι</u>

$$\Sigma\vec{F}_X = 0 \Rightarrow$$

$$F_{\varepsilon\lambda} = w_x \Rightarrow k \cdot \Delta l_o = m_1 \cdot g \cdot \eta\mu\varphi \Rightarrow$$

$$100 \cdot \Delta l_0 = 5 \Rightarrow$$

$$\Delta l_0 = 0,05m$$

<u>Νέα ΘΙ</u>

$$\Sigma\vec{F}_X = 0 \Rightarrow$$
$$F_{\varepsilon\lambda}' = w_{2x} \Rightarrow k\cdot\Delta l_1 = (m_1+m_2)\cdot g\cdot \eta\mu\varphi \Rightarrow$$
$$100\cdot\Delta l_1 = 20 \Rightarrow$$
$$\Delta l_1 = 0,2m$$
$$x_2 = \Delta l_1 - \Delta l_0 = 0,15m$$

ΑΔΕΤ αμέσως μετά την κρούση

$$\mathrm{E}_\tau = \mathrm{K} + U_\mathrm{T} \Rightarrow$$
$$\frac{1}{2}\cdot D\cdot A^2 = \frac{1}{2}(m_1+m_2)\cdot u_\varepsilon^2 + \frac{1}{2}\cdot D\cdot(x_2)^2 \Rightarrow$$
$$100\cdot A^2 = 4\cdot\frac{9\cdot 3}{16} + \frac{1}{2}\cdot 100\cdot\frac{0,09}{4} \Rightarrow$$
$$100\cdot A^2 = \frac{27}{4} + \frac{9}{4} \Rightarrow$$
$$A = 0,3m$$

Γ3.

$$D = k \Rightarrow (m_1 + m_2)\cdot \omega^2 = k \Rightarrow \omega = 5 rad/s$$

$$t = 0, x = +0{,}15m, u < 0:$$

$$x = A\eta\mu(\omega t + \varphi_0) \Rightarrow$$

$$0{,}15 = 0{,}3\eta\mu\varphi_0 \Rightarrow \eta\mu\varphi_0 = \frac{1}{2}$$

$$\varphi_0 = \begin{cases} 2\kappa\pi + \dfrac{\pi}{6} \\ 2\kappa\pi + \pi - \dfrac{\pi}{6} \end{cases} \overset{\kappa=0}{\Rightarrow} \varphi_0 \Rightarrow \begin{cases} \dfrac{\pi}{6} rad \\ \dfrac{5\pi}{6} rad \end{cases}$$

$$u < 0 \Rightarrow \sigma\upsilon\nu\varphi_0 < 0 \Rightarrow \varphi_0 = \frac{5\pi}{6} rad$$

$$\boxed{x(t) = 0{,}3\eta\mu(5t + \frac{5\pi}{6})(SI)}$$

Γ4. K=8U για 2η φορά :

<u>ΑΔΕΤ</u>

$$\mathrm{E}_T = K + U_T \Rightarrow \mathrm{E}_\mathrm{T} = 9U_T \Rightarrow x = \pm\frac{A}{3}$$

Για 2η φορά

$$x = -\frac{A}{3}$$

$$\left|\frac{F_{\varepsilon\lambda}}{\Sigma F}\right| = \frac{k(\Delta l_1 + \frac{A}{3})}{k\frac{A}{3}} = 3$$

<u>ΘΕΜΑ Δ</u>

Δ1.

(i)

$$x_1 = \frac{L}{2}\eta\mu\varphi = 0,3m$$

$$x_2 = L\eta\mu\varphi = 0,6m$$

$$y_2 = L\sigma\upsilon\nu\varphi = 0,8m$$

$$y_1 = \frac{L}{2}\sigma\upsilon\nu\varphi = 0,4m$$

$$\Sigma\tau_{(\mathrm{A})} = 0 \Rightarrow w_1x_1 + wx_2 - T_\nu y_1 = 0 \Rightarrow$$

$$60\cdot 0,3 + 10\cdot 0,6 - T_\nu \cdot 0,4 = 0 \Rightarrow$$

$$T_\nu = 60\mathrm{N}$$

(ii)

$$\Sigma\tau_{(\mathrm{E})} = 0 \Rightarrow -w_2R + T_\nu R = 0 \Rightarrow M_2 = 6kg$$

Δ2.

$$\mathrm{I}_\sigma = \mathrm{I}_m + \mathrm{I}_\rho = mL^2 + \frac{1}{3}M_1L^2 = 3kg\cdot m^2$$

Θεμελιώδης Νόμος της Στροφικής

$$\Sigma\vec{\tau} = \mathrm{I}_\sigma\cdot\vec{\alpha}_\gamma \Rightarrow w_1x_1 + wx_2 = I_\sigma\cdot\alpha_\gamma \Rightarrow$$

$$60\cdot 0,3 + 10\cdot 0,6 = 3\cdot\alpha_\gamma \Rightarrow \alpha_\gamma = 8rad/s^2$$

Δ3.

(i) <u>ΘΜΚΕ</u>

$$\mathrm{K}_{\tau\varepsilon\lambda} - \mathrm{K}_{\alpha\rho\chi} = W_{w_1} + W_w \Rightarrow$$

$$\frac{1}{2}\cdot \mathrm{I}_\sigma \cdot \omega^2 - 0 = w_1 \cdot y_1 + w \cdot y_2 \Rightarrow$$

$$\frac{1}{2}\cdot 3 \cdot \omega^2 = 60\cdot 0,4 + 10\cdot 0,8 \Rightarrow$$

$$\frac{3}{2}\cdot \omega^2 = 24 + 8 \Rightarrow \frac{3}{2}\cdot \omega^2 = 32 \Rightarrow$$

$$\omega^2 = \frac{64}{3} \Rightarrow \omega = \frac{8\sqrt{3}}{3}\frac{rad}{s}$$

$$\Delta\vec{L} = \vec{L}_{\tau\varepsilon\lambda} - \vec{L}_{\alpha\rho\chi} \overset{L_{\alpha\rho\chi}=0}{\Rightarrow}$$

$$\Delta L = \mathrm{I}_\sigma \omega = 8\sqrt{3} kgm^2 / s$$

(ii)

Από το τετράδιο προς τον αναγνώστη. ⊙

Δ4.

<u>ΘΜΚΕ (1) στη (2)</u>

$$\mathrm{K}_2 - \mathrm{K}_1 = Ww \Rightarrow$$

$$\frac{1}{2}\mathrm{I}_\sigma \cdot \omega^2 + \frac{1}{2}\cdot \mathrm{M}_2 \cdot u_{cm}^2 - 0 = M_2 \cdot g \cdot (R-r) \Rightarrow$$

$$\frac{1}{2}\cdot\frac{1}{2}\cdot M_2 \cdot R^2 \cdot \frac{u_{cm}^2}{R^2} + \frac{1}{2}\cdot M_2 \cdot u_{cm}^2 = M_2 \cdot g \cdot (R-r) \Rightarrow$$

$$\frac{3}{4}\cdot u_{cm}^2 = g \cdot (R-r) \Rightarrow$$

$$u_{cm} = \sqrt{\frac{4}{3}\cdot g \cdot (R-r)} \Rightarrow$$

$$u_{cm} = \sqrt{\frac{4}{3}\cdot 10 \cdot 2,7} \Rightarrow$$

$$u_{cm} = 6\frac{m}{s}$$

Δ5. (i)

$$S_{\tau\varepsilon\tau} = \frac{\pi R}{2} = 1,4\pi m$$

$$\theta_{\tau\varepsilon\tau} = \frac{S_{\tau\varepsilon\tau}}{r} = \frac{1,4\pi}{0,1} = 14\pi rad$$

$$N_{\tau\varepsilon\tau} = \frac{\theta}{2\pi} = 7\pi\varepsilon\rho\iota\sigma\tau\rho o\varphi\acute{\varepsilon}\varsigma$$

(ii)

$$s = r\cdot\theta \Rightarrow \pi = 0,1\theta \Rightarrow \theta = 10\pi rad$$

$$N = \frac{\theta}{2\pi} = 5\pi\varepsilon\rho\iota\sigma\tau\rho o\varphi\acute{\varepsilon}\varsigma$$