ΠΑΝΕΛΛΑΔΙΚΕΣ ΕΞΕΤΑΣΕΙΣ

Γ΄ ΤΑΞΗΣ ΗΜΕΡΗΣΙΟΥ ΓΕΝΙΚΟΥ ΛΥΚΕΙΟΥ

ΔΕΥΤΕΡΑ 23 ΜΑΪΟΥ 2016

ΕΞΕΤΑΖΟΜΕΝΟ ΜΑΘΗΜΑ: ΦΥΣΙΚΗ

ΠΡΟΣΑΝΑΤΟΛΙΣΜΟΥ (ΝΕΟ ΣΥΣΤΗΜΑ)

ΘΕΜΑ Α

Α1) β

Α2) γ

Α3) β

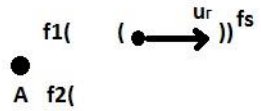
Α4) δ

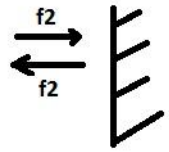
Α5) α)Σ β)Λ γ)Σ δ)Λ ε)Λ

ΘΕΜΑ Β

Β1)

Σωστό το iii





Από το τρένο απευθείας (κιν.πηγή απομακρυνόμενη από ακιν.παρατ.)

$$f_1 = \frac{u_{\eta\chi}}{u_{\eta\chi} + \frac{u_{\eta\chi}}{10}} f_s \Rightarrow f_1 = \frac{10}{11} f_s$$

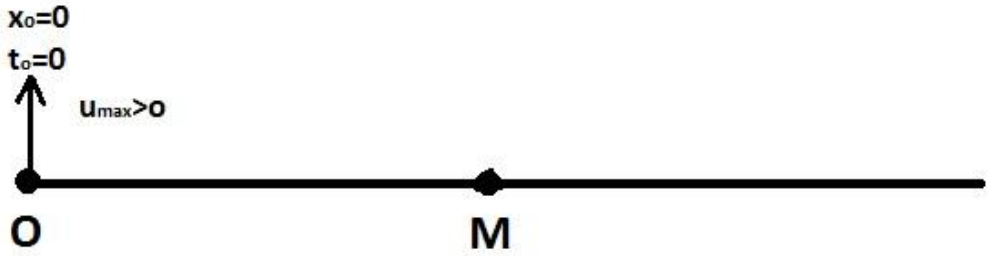
στον βράχο: κιν. πηγή προς ακιν. παρατ.

$$f_2 = \frac{u_{\eta\chi}}{u_{\eta\chi} - \frac{u_{\eta\chi}}{10}} f_s \Rightarrow f_2 = \frac{10}{9} f_s$$

από ακιν. βράχο προς ακίνητο παρατηρητή δεν αλλάζει η f_2

άρα $\frac{f_1}{f_2} = \frac{9}{11}$ σωστό το iii

B2)



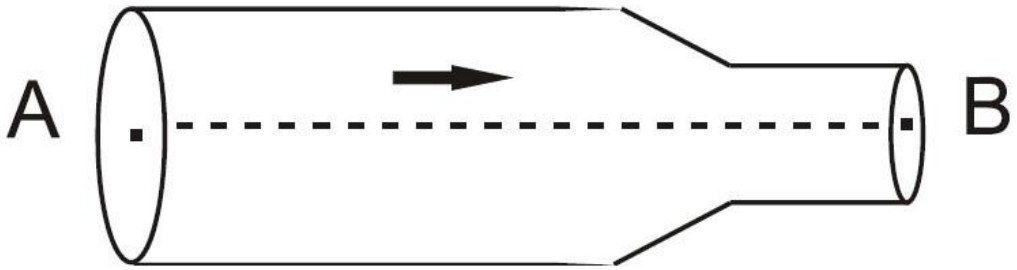
$$|A'_M| = |2A\sigma\upsilon\nu\frac{2\pi x}{\lambda}| = |2A\sigma\upsilon\nu\frac{2\pi\frac{9\lambda}{8}}{\lambda}| = 2A\sigma\upsilon\nu\frac{2\pi\cdot 9\lambda}{8\lambda} =$$

$$2A\sigma\upsilon\nu\frac{9\pi}{4} = 2A|\sigma\upsilon\nu\left(\frac{8\pi+\pi}{4}\right)| = 2A\sigma\upsilon\nu\left(2\pi+\frac{\pi}{4}\right) =$$

$$2A\sigma\upsilon\nu\frac{\pi}{4} = 2A\frac{\sqrt{2}}{2} = A\sqrt{2}$$

$$\upsilon_{\underset{M}{max}} = \omega\cdot|A'_M| = \frac{2\pi}{T}\cdot A\sqrt{2} \quad (i)$$

Β3)



$$A_A = 2A_B \qquad \frac{1}{2}pu^2{}_A = \Lambda$$

$$\Pi_A = \Pi_B \Rightarrow \upsilon_A\cdot A_A = \upsilon_B A_B \Rightarrow \upsilon_A 2A_B = \upsilon_B A_B$$
$$\Rightarrow \upsilon_B = 2\upsilon_A$$

Bernoulli

$$P_A + \frac{1}{2}\rho u^2_A = P_B + \frac{1}{2}\rho u^2_B \Rightarrow$$

$$P_A + \frac{1}{2}\rho u^2_A = P_B + \frac{1}{2}\rho 4u^2_A \Rightarrow$$

$$P_A - P_B = \frac{1}{2}\rho 4u^2_A - \frac{1}{2}\rho u^2_A \Rightarrow$$

$$P_A - P_B = 3\cdot\frac{1}{2}\rho u^2_A \Rightarrow$$

$$P_A - P_B = 3\Lambda$$

σωστή (ii)

ΘΕΜΑ Γ

Γ1)

$$\underset{m_1}{\Theta MKE}: K_\Gamma - K_A = W_{W_1} + W_N \Rightarrow$$

$$\frac{1}{2}m_1\upsilon_\Gamma^2 = m_1 gR \Rightarrow \upsilon_\Gamma = 10\, m/s$$

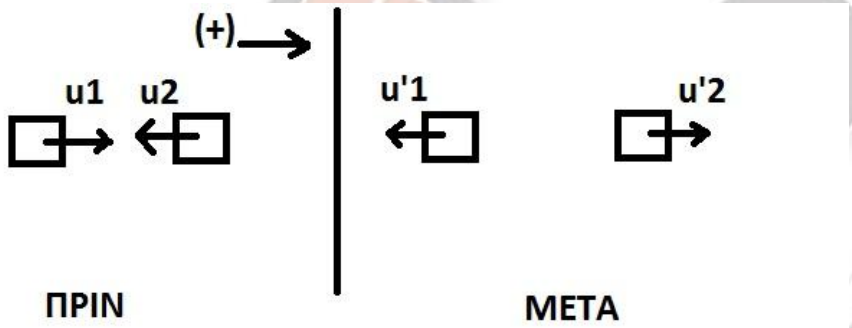
Γ2)

$$\underset{m_1\ \Gamma\to\Delta}{\Theta\text{MKE}}: \mathrm{K}_\Delta - \mathrm{K}_\Gamma = W_\mathrm{N} + W_N + W_T \Rightarrow$$

$$\frac{1}{2}m_1\upsilon_1^2 - \frac{1}{2}m_1\upsilon_\Gamma{}^2 = -\mu m_1 g S_1 \Rightarrow \upsilon_1^2 = \upsilon_\Gamma{}^2 - 2\mu g S_1 \Rightarrow \upsilon_1 = 8\,m/s$$

$$\left.\begin{array}{l} T = \mu \mathrm{N} \\ \Sigma F_y = 0 \Rightarrow N = w_1 = m_1 g \end{array}\right| \Rightarrow T = \mu m_1 g$$

Από ΑΔΟ και ΑΔΚΕ

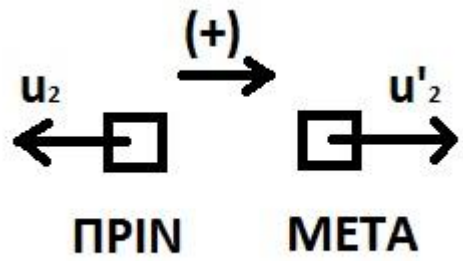


$$-u_1' = \frac{m_1 - m_2}{m_1 + m_2}u_1 + \frac{2m_2}{m_1 + m_2}(-u_2) \Rightarrow -u_1' = \frac{-2m_1u_1}{4m_1} - \frac{6m_1}{4m_1}u_2 \Rightarrow u_1' = 10m/s$$

$$u_2' = \frac{2m_1}{m_1 + m_2}u_1 + \frac{m_2 - m_1}{m_1 + m_2}(-u_2) \Rightarrow u_2' = \frac{2m_1}{4m_1}u_1 - \frac{2m_1}{4m_1}u_2 \Rightarrow u_2' = 2m/s$$

Άρα $u_1' = 10m/s$ *αριστερά* , $u_2' = 2m/s$ *δεξιά*

Γ3)



$$\Delta \vec{p}_2 = \vec{p}'_2 - \vec{p}_2$$

$$\Delta p_2 = m_2 u_2' - (-m_2 u_2) = m_2 (u_2' + u_2) = 18\,kg\,\frac{m}{s}$$

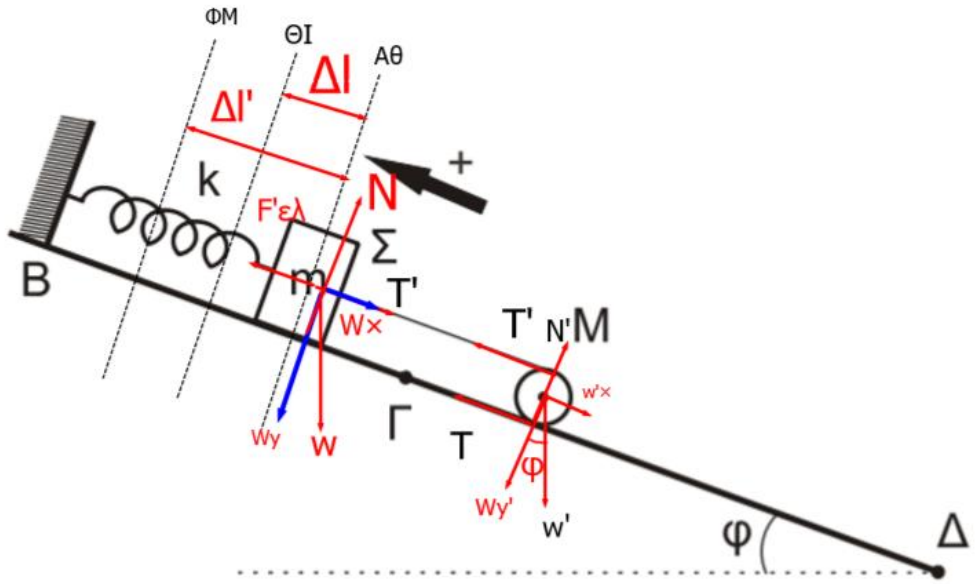
Φορά δεξιά

Γ4)

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

$$= \left(\frac{\frac{1}{2} m_1 u_1'^2}{\frac{1}{2} m_1 u_1^2} - 1 \right) \cdot 100 = \frac{36}{64} \cdot 100 \Rightarrow 56,25\%$$

ΘΕΜΑ Δ



Δ1)

$$\text{κυλ.}\quad \Sigma\tau_{A} = 0 \Rightarrow Mg\eta\mu\varphi R - T'2R = 0 \Rightarrow T' = \frac{Mg\eta\mu\varphi}{2} = 5N$$

$$\text{m}:\quad \Sigma F_x = 0 \Rightarrow T' + mg\eta\mu\varphi - F'_{\varepsilon\lambda} = 0 \Rightarrow$$

$$F'_{\varepsilon\lambda} = T' + mg\eta\mu\varphi \Rightarrow F'_{\varepsilon\lambda} = 10N$$

$$F'_{\varepsilon\lambda} = \kappa \cdot \Delta l \Rightarrow \Delta l' = 0{,}1m$$

Δ2)

Όταν κόβεται το νήμα το σώμα είναι ακίνητο άρα σε Α.Θ. ταλάντωσης.

το κέντρο ταλ. είναι:

$\Theta I: \Sigma F_x = 0 \Rightarrow F_{\varepsilon\lambda} = w_x \Rightarrow k\Delta l = mg\eta\mu\varphi \Rightarrow \Delta l = 0,05m$ από το ΦΜ

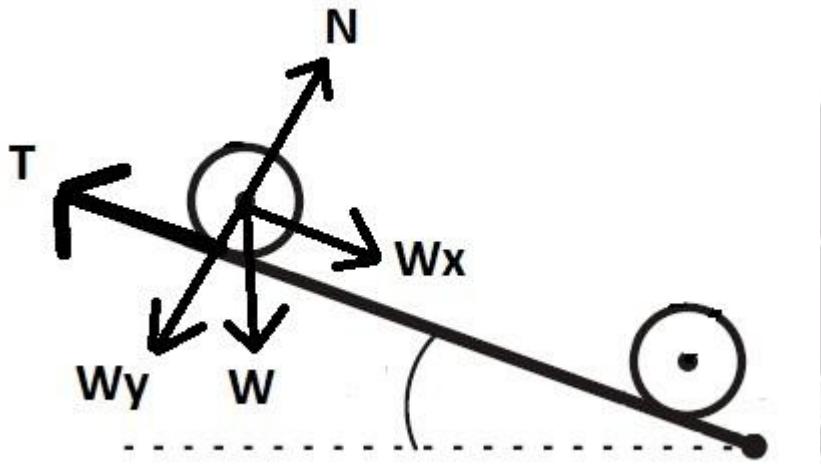
Άρα το πλάτος είναι $A = \Delta l' - \Delta l = 0,05m$

για $t = 0$ $x = -A \Rightarrow \varphi_0 = \frac{3\pi}{2} rad$, $\omega = \sqrt{\frac{\kappa}{m}} = 10 rad/s$

Άρα $\Sigma F = -kx \Rightarrow \Sigma F = -kA\eta\mu(\omega t + \varphi_0)$

$$\Sigma F = -5\eta\mu(10t + \frac{3\pi}{2})$$

Δ3)



ΘΕΕ:

$$K_2 - K_1 = W_{w_x} + W_{w_y} + W_N + (W_{T_{μετ}} + W_{τ_{τ,στρ}})^{0*} \Rightarrow$$

$$\frac{1}{2}Mu_{cm}^2 + \frac{1}{2}\cdot\frac{1}{2}M\underbrace{R^2\omega^2}_{u_{cm}^2} = Mg\eta\mu\varphi\cdot S$$

$$S = \theta\cdot R = 2\pi NR = 2\pi\frac{12}{\pi}\cdot\frac{1}{10} = 2,4\text{m}$$

$$\text{Αρα}: \frac{3}{4}R^2\omega^2 = g\eta\mu\varphi\cdot S \Rightarrow \frac{3}{4}\omega^2\cdot\frac{1}{100} = 10\cdot\frac{1}{2}\cdot 2,4 = 12$$

$$\omega^2 = 1600 \Rightarrow \omega = 40\text{rad/s}$$

$$L = I_{cm}\cdot\omega = \frac{1}{2}MR^2\cdot\omega = \frac{1}{2}\cdot 2\cdot\frac{1}{100}\cdot 40 = 0,4\text{kg}\frac{\text{m}^2}{\text{s}}$$

$$\left.\begin{aligned} *W_T &= -T\Delta x \\ W_{τ_{τ,στρ}} &= TR\Delta\theta = T\Delta x \end{aligned}\right\} W_{τ_{ολ}} = 0$$

Δ4)

$$\frac{dK_{ολ}}{dt} = \frac{dK_{μετ}}{dt} + \frac{dK_{στρ.}}{dt} = \Sigma F\cdot u_{cm} + \Sigma\tau\cdot\omega$$
$$= (w_X - T)u_{cm} + TR\omega$$
$$= w_X u_{cm} - Tu_{cm} + Tu_{cm}$$
$$= Mg\,\eta\mu\varphi\cdot u_{cm}$$

$2^{ος}$ Ν.Ν. μετ

$$\left.\begin{array}{l} Mg\eta\mu\varphi - \mathrm{T} = \mathrm{M}\alpha_{cm} \\ T\cdot R = \frac{1}{2}MR^2\,\frac{\alpha_{cm}}{R} \end{array}\right| \Rightarrow Mg\eta\mu\varphi = \frac{3}{2}\mathrm{M}a_{cm}$$

ΘΝΣΚ. στρ.

$$\alpha_{cm} = \frac{2}{3}g\eta\mu\varphi$$

$$\alpha_{cm} = \frac{10}{3}m/s^2$$

Κ.χ. ολ. $\alpha_{\gamma} = \frac{\alpha_{cm}}{R}$

$$u_{cm} = \alpha_{cm}\cdot t = 10\,m/s$$

Άρα $\frac{d\mathrm{K}_{o\lambda}}{dt} = 100\ Watt\ (j/s)$

Επιμέλεια

Αγγελής Γ.

Δοξόπουλος Κ.