Πανελλήνιες 2016

Φυσική

– απαντήσεις –

Σχόλιο

– Θέματα μέτριας δυσκολίας
βασισμένα στο σχολικό βιβλίο.

– Τα ενδεικτικά θέματα
των πανελλαδικών εξετάσεων.

## Ζητημα 1ο

$A_1$ β $A_2$ γ $A_3$ β $A_4$ δ

$A_5$ α Σ β Λ γ Σ δ Λ ε Λ

## Ζητημα 2ο

B1) Σωστό το (iii)

$$f_1 = \frac{v}{v+\frac{v}{10}} f_s = \frac{10}{11} f_s$$

$$f_2 = \frac{v}{v-\frac{v}{10}} f_s = \frac{10}{9} f_s$$

$$\dots \frac{f_1}{f_2} = \frac{9}{11}$$

η από ανάκλαση συχνότητα που φθάνει στον παρατηρητή είναι ίση με την συχνότητα με την οποία ο ήχος φθάνει στο τούνελ.

Β 2) Σωστό το (i)

$$A_M = 2A\left|\sigma\upsilon\nu 2\pi \frac{\frac{9\lambda}{8}}{\lambda}\right| = 2A\left|\sigma\upsilon\nu\frac{\pi}{4}\right| = A\sqrt{2}$$

$$U_{max} = \frac{2\pi}{T} A_M \Longrightarrow \boxed{U_{max} = 2\sqrt{2}\,\frac{\pi A}{T}}$$

Β 3) Σωστό το (ii)

$$\Pi = \alpha\upsilon \Longrightarrow A_A U_A = A_B U_B \rightarrow U_B = 2U_A$$

$$\frac{K_B}{\Delta V} = \frac{1}{2}\rho U_B^2 = \frac{1}{2}\rho 4U_A^2 = 4\frac{K_A}{\Delta V} = 4\,\text{Pa}$$

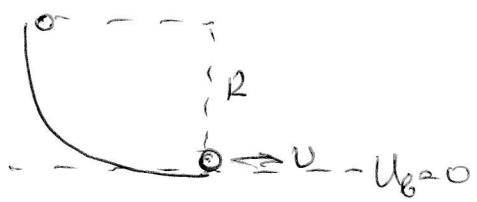
Bernoulli:

$$P_A + \frac{K_A}{\Delta V} = P_B + \frac{K_B}{\Delta V} \rightarrow$$

$$\boxed{P_A - P_B = 3\,\text{Pa}}$$

# Ζήτημα 3ο

**Γ1)**

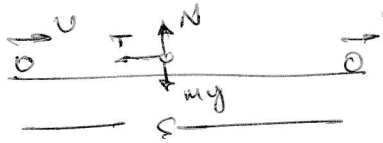



Διατ. $U_\Sigma + K = U_\Sigma' + K' \rightarrow$

$m_1 g R + 0 = \frac{1}{2} m_1 \upsilon^2 + 0 \rightarrow$

$\upsilon = \sqrt{2gR} \rightarrow$ **$\upsilon = 10$ m/s**

**Γ2)**




$\Sigma F_y = 0 \Rightarrow N = m_1 g$

$T = \mu N \Rightarrow T = \mu m_1 g \Rightarrow T = 5 m_1$

Θ.Μ.Κ.Ε. $K_T - K_A = W_T \rightarrow \frac{1}{2} m_1 \upsilon_1^2 - \frac{1}{2} m_1 \upsilon^2 = -5 m_1 S \rightarrow$

$\upsilon_1 = 8$ m/s

Αν $\upsilon_1 = +8$ m/s και $\upsilon_2 = -4$ m/s για την ελαστ. κρούση είναι:

$\upsilon_1' = \frac{2m_2}{m_1+m_2}\upsilon_2 + \frac{m_1-m_2}{m_1+m_2}\upsilon_1 = \ldots = -10$ m/s

$\upsilon_2' = \frac{2m_1}{m_1+m_2}\upsilon_1 + \frac{m_2-m_1}{m_1+m_2}\upsilon_2 = \ldots = +2$ m/s

**Γ3)**

$\vec{p}_{2\pi\rho} = m_2 \vec{\upsilon}_2 \rightarrow p_{2\pi\rho} = 3(-4) = -12$ kgr m/s

$\vec{p}_{2\mu\epsilon\tau} = m_2 \vec{\upsilon}_2' \rightarrow p_{2\mu\epsilon\tau} = 3(+2) = +6$ kgr m/s

$\Delta\vec{p}_2 = \vec{p}_{2\mu\epsilon\tau} - \vec{p}_{2\pi\rho}$

$\Delta p_2 = (+6) - (-12) \rightarrow$ **$\Delta p_2 = +18$ kgr m/s**

προς τα δεξιά

Γ4) $K_{1,\pi\rho} = \frac{1}{2} m_1 v_1^2 \rightarrow \dots K_{1,\pi\rho} = 32\ J$

$K_{1,\mu\epsilon\tau} = \frac{1}{2} m_1 (v_1')^2 \rightarrow \dots K_{1,\mu\epsilon\tau} = 50\ J$

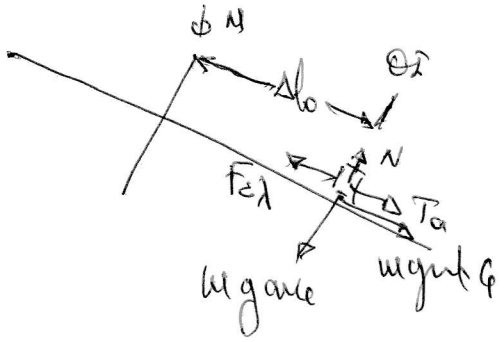
$\Delta K_1 = K_{1,\mu\epsilon\tau} - K_{1,\pi\rho} \rightarrow \dots \Delta K = 18\ J$

$\frac{\Delta K_1}{K_1} 100\% = \frac{18}{32} 100\% = 56,25\%$

# ΠΡΟΒΛΗΜΑ 4ο

Δ1) $I_{\alpha\mu} = \frac{1}{2} M R^2 = \dots \frac{1}{100}\ kgr\,m^2$

"ισορροπία του μ"



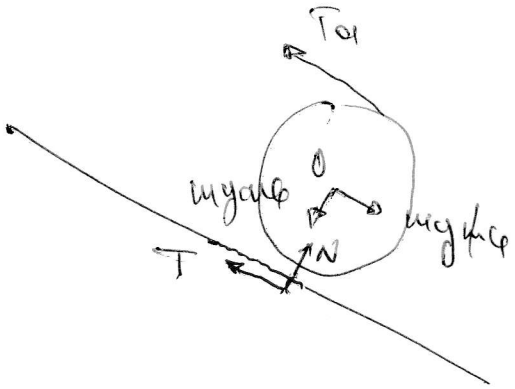

$\Sigma f_x = 0 \Rightarrow$

$+ mg\,\eta\mu\varphi + T_{\alpha} - F_{\gamma} = 0 \Rightarrow$

$+ mg\,\eta\mu\varphi + T_{\alpha} - k\,\Delta l_0 = 0 \Rightarrow$

$$\boxed{5 + T_{\alpha} - 100\,\Delta l_0 = 0} \quad (1)$$

"ισορροπία των κυλίνδρων"




$\Sigma \vec{f}_x = 0 \Leftrightarrow -T - T_{\alpha} + Mg\eta\mu\varphi = 0 \quad (\alpha)$

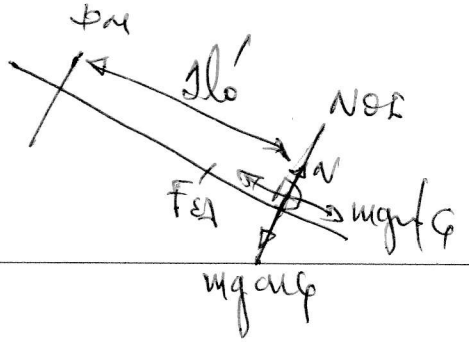
$\Sigma \vec{\tau}_{(O)} = 0 \Rightarrow +T_{\alpha} R - T R = 0 \Rightarrow$

$$T_{\alpha} = T \quad (\beta)$$

$(\alpha)(\beta) \Rightarrow \dots T = 5\ Nt.$

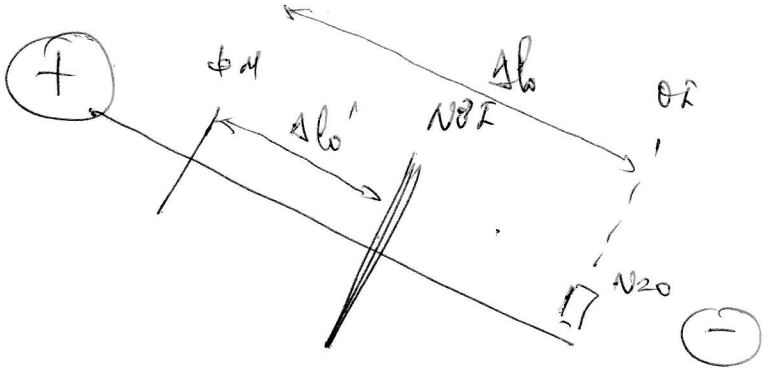
$(1) \Rightarrow \dots \Delta l_0 = \frac{1}{10}\ m$

Δ2) Η ταλάντωση θα είχε Νέα Θ.Ι. όταν :




$\Sigma f_x = 0 \Rightarrow mg\,\eta\mu\varphi = k\,\Delta l_{\acute{o}}$

$\Rightarrow \dots \Delta l_{\acute{o}} = \frac{5}{100}\ m$




την $t_{20}$ : $x = -(\Delta l_0 - \Delta l_0') = -\frac{5}{100}$ m  $\quad v = 0$

άρα $\omega = \sqrt{k/m} \Rightarrow \omega = 10$ r/s

$A = |x| \Rightarrow A = 5/100$ m

$\varphi_0 = 3\pi/2$ rad

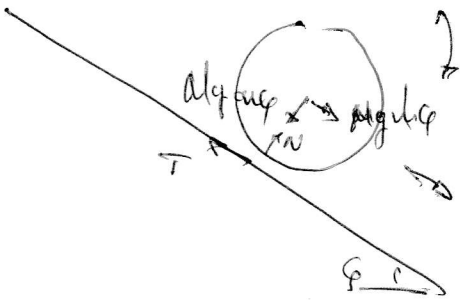
$x = A\eta\mu(\omega t + \varphi_0) \Rightarrow$

$x = \frac{5}{100}\eta\mu(10t + \frac{3\pi}{2})$

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

όπου $D = k$

Δ3) "κύλιση των κυλίνδρων"




$\Sigma \vec{F}_x = M\vec{a}_{cm} \Rightarrow$

$+ M g\eta\mu\varphi - T = M a_{cm}$ (α)

$\Sigma \vec{\tau}_{(cm)} = I_{cm}\vec{a}_\gamma \Rightarrow$

$+ T R = I_{cm} a_\gamma$ (β)

κύλιση : $\alpha_{cm} = \alpha_\gamma \cdot R$ (γ)

από τις (α) (β) & (γ) είναι :

$a_{cm} = \frac{10}{3}$ m/s$^2$ & $a_\gamma = \frac{100}{3}$ r/s$^2$

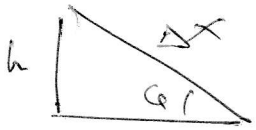
$N = \frac{\vartheta}{2\pi} \Rightarrow \vartheta = 24\ rad$

$\vartheta = \frac{1}{2}\alpha_\gamma t^2$
$\omega = \alpha_\gamma t$
} Με απαλοιφή χρόνου από τις πάνω
προκύπτει $\vartheta = \frac{\omega^2}{2\alpha_\gamma} \Rightarrow \omega = 40\ r/s$

και $L = I_{cm}\omega \Rightarrow$ $L = 0,4\ kg\ m^2/s$

β' τρόπο

$N = \frac{\Delta x}{2\pi R} \Rightarrow \Delta x = \dots$




$\varepsilon\varphi = \frac{h}{\Delta x} \Rightarrow h = \dots$

ΑΔΜΕ $U_\theta = K_\mu + K_\pi$ και $v_{cm} = \omega R$

$\dots \omega = 40\ r/s$

$\dots L = 0,4\ kg\ m/s$

Δ4) $\frac{\Delta K}{\Delta t} = \frac{\Delta K_{\mu\varepsilon}}{\Delta t} + \frac{\Delta K_{\pi\varepsilon}}{\Delta t}$

$= (+\Sigma F_x \, U_{cm}) + (+\Sigma \tau_{(o)} \, \omega)$

$= (M a_{cm} \, a_{cm} \, t) + (I_{cm} \, a_\gamma \, a_\gamma \, t)$

$= M a_{cm}^2 \, t + I_{cm} \, a_\gamma^2 \, t$

$\dots = 100 \, J/s$