ΠΑΝΕΛΛΗΝΙΕΣ ΕΞΕΤΑΣΕΙΣ
ΗΜΕΡΗΣΙΟΥ ΓΕΝΙΚΟΥ ΛΥΚΕΙΟΥ ΚΑΙ ΕΠΑ.Λ (ΟΜΑΔΑ Β)
ΠΑΡΑΣΚΕΥΗ 25 ΜΑΪΟΥ 2012
ΦΥΣΙΚΗ ΘΕΤΙΚΗΣ – ΤΕΧΝΟΛΟΓΙΚΗΣ ΚΑΤΕΥΘΥΝΣΗΣ

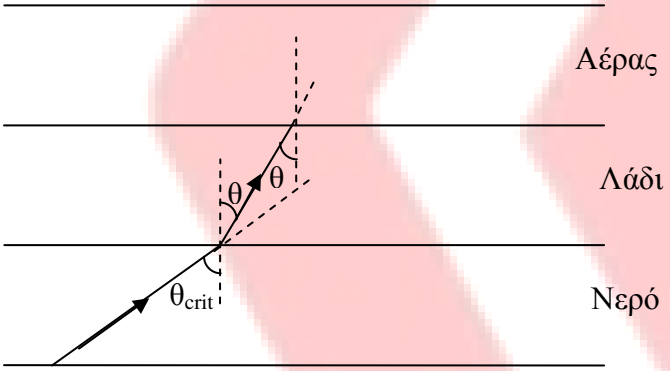
ΑΠΑΝΤΗΣΕΙΣ

ΘΕΜΑ Α

Α1 - γ
Α2 - β
Α3 - γ
Α4 - γ
Α5. α - Σ, β - Σ, γ - Λ, δ - Λ, ε - Σ

ΘΕΜΑ Β

Β1. – γ



$n_\Lambda > n_N \qquad \eta\mu\theta_{crit} = \dfrac{n_{\alpha\epsilon\rho\alpha}}{n_N} = \dfrac{1}{n_N} \quad (1)$

N. Snell $n_N \eta\mu\theta_{crit} = n_\Lambda \eta\mu\theta \overset{(1)}{\Rightarrow}$

$1 = n_\Lambda \eta\mu\theta \Rightarrow \eta\mu\theta = \dfrac{1}{n_\Lambda} \quad (2)$

$\eta\mu\theta_{crit_2} = \dfrac{1}{n_\Lambda} \quad (3)$

$(2,3) \Rightarrow \eta\mu\theta = \eta\mu\theta_{crit\,2} \Rightarrow \theta = \theta_{crit\,2}$

Άρα κινείται πάνω στη διαχωριστική

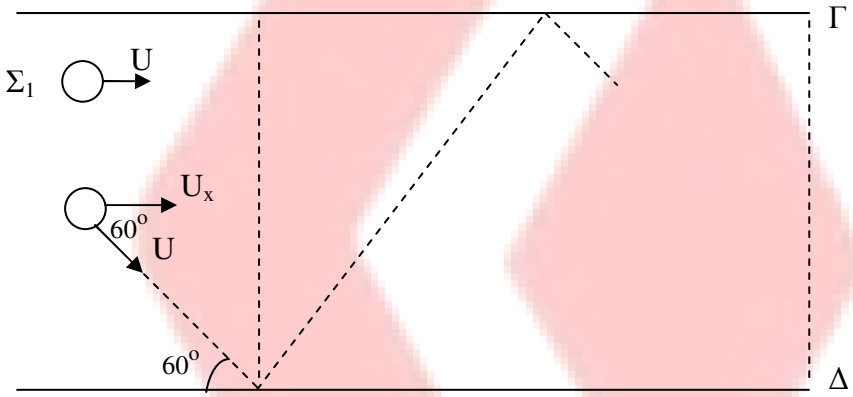
B2. – α

$$\chi_K = \frac{\lambda}{4} - \frac{\lambda}{6} = \frac{3\lambda}{12} - \frac{2\lambda}{12} = \frac{\lambda}{12}$$

$$\chi_\Lambda = \frac{\lambda}{4} + \frac{\lambda}{12} = \frac{3\lambda}{12} + \frac{\lambda}{12} = \frac{\lambda}{3}$$

$$\frac{\upsilon_{K,max}}{\upsilon_{\Lambda,max}} = \frac{\omega A_K}{\omega A_\Lambda} = \frac{2A\sigma\upsilon\nu\left(\frac{2\pi\frac{\lambda}{12}}{\lambda}\right)}{2A\sigma\upsilon\nu\left(\frac{2\pi\frac{\lambda}{3}}{\lambda}\right)} \Rightarrow \frac{\upsilon_K}{\upsilon_\Lambda} = \frac{\frac{\sqrt{3}}{2}}{\left|-\frac{1}{2}\right|} = \sqrt{3}$$

B3. – α



$$t_1\upsilon = A\Gamma$$

$$\Rightarrow t_1\upsilon = t_2\upsilon\sigma\upsilon\nu 60 \Rightarrow t_1 = t_2\frac{1}{2} \Rightarrow t_2 = 2t_1$$

$$t_2\upsilon_x = A\Gamma$$

ΘΕΜΑ Γ

Γ1.

$$I = I_{\rho\alpha\beta\delta(o)} + I_{m(o)}$$

$$I = \frac{1}{12}M\ell^2 + M\frac{\ell^2}{4} + \frac{M}{2}\ell^2$$

$$I = \frac{10}{12}M\ell^2$$

$$I = 0,45 kgm^2$$

Γ2.

$$W_{\rho o \pi \acute{\eta} \varsigma (F)} = F\theta = F\ell\frac{\pi}{2}$$

$$W_{\rho o \pi \acute{\eta} \varsigma (F)} = \frac{120}{\pi}0,3\frac{\pi}{2}$$

$$W_{\rho o \pi \acute{\eta} \varsigma} = 18J$$

Γ3.

ΘΜΚΕ

$$\frac{1}{2}I\omega^2 = W_F + W_{\beta \alpha \rho o \varsigma}$$

$$\frac{1}{2}I\omega^2 = W_F - Mg\frac{\ell}{2} - mg\ell$$

$$\frac{1}{2}0,4\cdot 5^2\omega^2 = 18 - 9 - 9 = 0$$

$$\omega = 0$$

Γ4

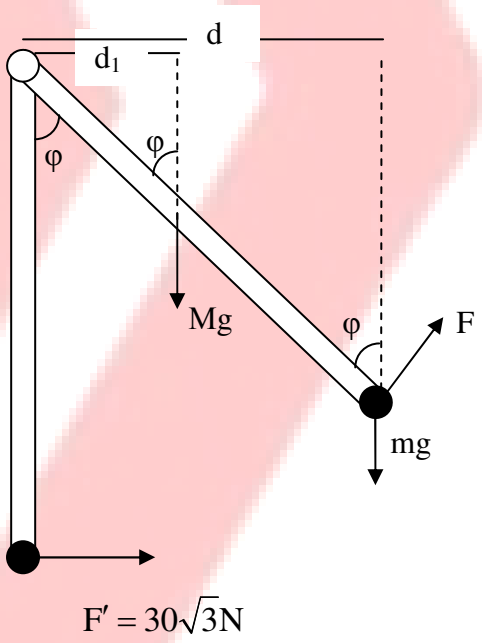
$$K_{\Pi} = \frac{1}{2}I\omega^2 = max \Rightarrow \omega = max \Rightarrow \Sigma\tau = 0 \quad (1)$$

$$T_F = F\cdot\ell = 30\sqrt{3}\ell = 9\sqrt{3} = \sigma\tau\alpha\theta\epsilon\rho\acute{\eta}$$

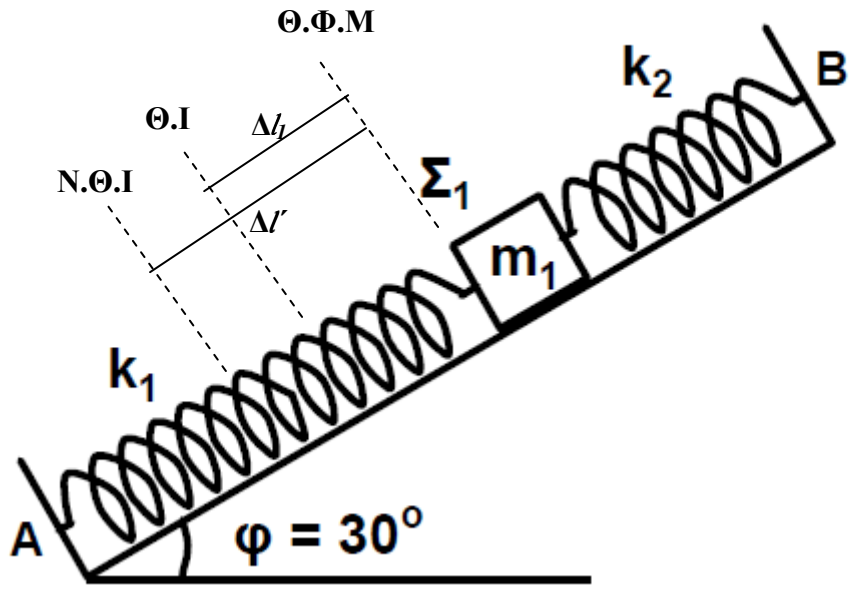
$$(1) \Rightarrow T_F = T_{B\alpha\rho\acute{\omega}\nu} \Rightarrow 9\sqrt{3} = Mgd_1 + mgd \Rightarrow$$

$$\Rightarrow 9\sqrt{3} = 60\frac{\ell}{2}\eta\mu\varphi + 30\ell\eta\mu\varphi \Rightarrow$$

$$\Rightarrow 9\sqrt{3} = 9\eta\mu\varphi + 9\eta\mu\varphi \Rightarrow \eta\mu\varphi = \frac{\sqrt{3}}{2} \Rightarrow \varphi = 60^o$$



ΘΕΜΑ Δ



Δ1.

Στη Θ.Ι. το ελατήριο (1) έχει συμπιεστεί κατά $\Delta\ell$ και το ελατήριο (2) έχει επιμηκυνθεί κατά $\Delta\ell$

$$\Sigma F_x = 0 \Rightarrow mg\eta\mu\varphi - K_1\Delta\ell - K_2\Delta\ell = 0 \Rightarrow mg\eta\mu\varphi = (K_1 + K_2)\Delta\ell \quad (1)$$

Απομακρύνω κατά x κάτω από Θ.Ι. τότε

$$\Sigma Fx = mg\,\eta\mu\varphi - K_1(\Delta\ell + x) - K_2(\Delta\ell + x)$$

$$\Sigma Fx = mg\,\eta\mu\varphi - K(\Delta\ell + \Delta\ell) - (K_1 + K_2)x = -(K_1 + K_2)x$$

άρα α.α. τ με $D = K_1 + K_2 = 200N/m$

Δ2.

$$t = 0 \quad x = \Delta\ell_1 = \frac{mg\,\eta\mu\varphi}{K_1 + K_2} = \frac{10}{200} = 0,05m$$

$$\upsilon = 0$$

άρα $A = 0,05 = x$

$$x = A\,\eta\mu(\omega t + \varphi_0) \Rightarrow \varphi_0 = \pi/2$$

$$t = 0$$

$$x = A$$

$$x = 0,05\,\eta\mu\left(10t + \frac{\pi}{2}\right) \text{ (S.I.)}$$

Δ3.

$$\left.\begin{array}{c} D_2 = m_2\omega^2 \\ D = K = (m_1+m_2)\omega^2 \end{array}\right\} \Rightarrow \frac{D_2}{K} = \frac{m_2}{m_1+m_2} \Rightarrow \frac{D_2}{200} = \frac{6}{8} \Rightarrow D_2 = \frac{1200}{8} \Rightarrow D_2 = 150N/m$$

Δ4.

Η νέα θέση ισορροπίας $\Sigma Fx = 0 \Rightarrow (m_1+m_2)g\eta\mu\varphi = (k_1+k_2)(\Delta\ell') \Rightarrow$

$\Rightarrow 40 = 200\Delta\ell' \Rightarrow \Delta\ell' = 0,2m = A'$

Σε τυχαία θέση της α.α.τ

Για Σ_2

$\Sigma Fx = -D_2x \Rightarrow -mg\eta\mu\varphi + T = -D_2x \Rightarrow T = m_2g\eta\mu\varphi - D_2x \quad (1)$

Όμως

$T < T_{ολισθ} \Rightarrow T < \mu N \Rightarrow T < \mu m_2 g\sigma\upsilon\nu\varphi \overset{(1)}{\Rightarrow} m_2g\eta\mu\varphi - D_2x < \mu m_2 g\sigma\upsilon\nu\varphi \Rightarrow$

$\Rightarrow \mu > \frac{m_2g\eta\mu\varphi - D_2x}{m_2g\sigma\upsilon\nu\varphi}$

Για $x = -A' = -0,2 \Rightarrow \mu_{min} = \frac{2\sqrt{3}}{3}$

ΕΠΙΜΕΛΕΙΑ ΑΠΑΝΤΗΣΕΩΝ
ΛΑΙΟΣ ΠΕΤΡΟΣ
ΔΕΛΓΑΣ ΓΙΩΡΓΟΣ
ΔΕΛΑΤΟΛΑΣ ΑΛΕΞΑΝΔΡΟΣ