# ΦΥΣΙΚΗ Γ' ΛΥΚΕΙΟΥ ΘΕΤΙΚΗΣ ΚΑΤΕΥΘΥΝΣΗΣ

## ΑΠΑΝΤΗΣΕΙΣ

## ΘΕΜΑ Α

Α1) → Γ , Α2) → Β , Α3 → Β , Α4) → Β Α5) → Α → Λάθος; Β → Σωστό; Γ → Σωστό; Δ → Λάθος; Ε → Σωστό

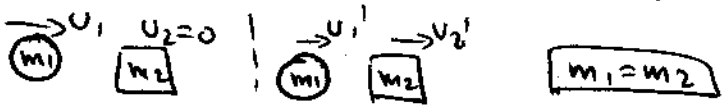
## ΘΕΜΑ Β1 Σωστό είναι το (γ)

$E_1 = E_2 \Rightarrow \frac{1}{2} D A_1^2 = \frac{1}{2} D A_2^2 \Rightarrow \boxed{A_1 = A_2}$

$E_{ολ} = E_1 \Rightarrow \frac{1}{2} D A_{ολ}^2 = \frac{1}{2} D A_1^2 \Rightarrow \boxed{A_{ολ} = A_1}$

$A_{ολ} = \sqrt{A_1^2 + A_2^2 + 2A_1A_2\sigma\upsilon\nu\varphi} \Rightarrow A_1^2 = A_1^2 + A_1^2 + 2A_1A_1\sigma\upsilon\nu\varphi \Rightarrow \sigma\upsilon\nu\varphi = -\frac{1}{2} \Rightarrow \varphi = \frac{2\pi}{3}$

## ΘΕΜΑ Β2 Σωστό είναι το (α)




$m_1 = m_2$

$K_2' = 36\% K_1 \Rightarrow \frac{1}{2} m_2 \upsilon_2'^2 = \frac{36}{100} \frac{1}{2} m_1 \upsilon_1^2 \Rightarrow \boxed{\upsilon_2' = 0{,}6\upsilon_1}$

ΑΔΟ $\Rightarrow m_1\upsilon_1 = m_1\upsilon_1' + m_2\upsilon_2' \Rightarrow \boxed{\upsilon_1' = 0{,}4\upsilon_1}$

$K_{ολ}^{μετα} = \frac{1}{2} m_1 \upsilon_1'^2 + \frac{1}{2} m_2 \upsilon_2'^2 = \frac{1}{2} m_1 (0{,}36\upsilon_1^2 + 0{,}16\upsilon_1^2) = 0{,}52 \cdot \frac{1}{2} m_1 \upsilon_1^2 = 0{,}52 K_1$

$Q_{θερ} = K_{ολ}^{πριν} - K_{ολ}^{μετα} = K_1 - 0{,}52K_1 = 0{,}48K_1$

## Θέμα Β3 Σωστό το (ii)

$f_\Delta = \frac{1}{T_\Delta} = \frac{1}{0{,}7 - 0{,}2} = \frac{1}{0{,}5} \Rightarrow \boxed{f_\Delta = 2\,Hz}$ $\quad f_2 - f_1 = f_\Delta \Rightarrow \boxed{f_2 = 21\,Hz}$

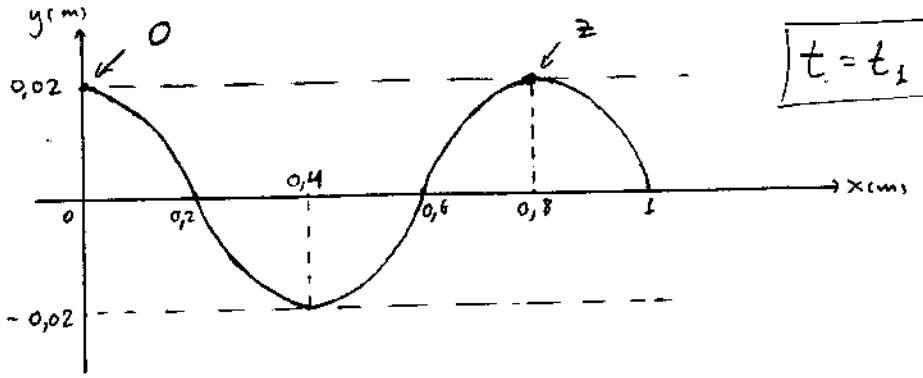
$f_{ταλ} = \frac{f_1 + f_2}{2} \Rightarrow \boxed{f_{ταλ} = 20\,Hz}$

## Θέμα Β4 Σωστό το ( )

$K_{μεταφ} = K_{περ} \Rightarrow \frac{1}{2} m \cdot \upsilon_{cm}^2 = \frac{1}{2} I \omega^2$ $\quad \upsilon_{cm} = \omega R \Longrightarrow m\omega^2 R^2 = I\omega^2$

$\Rightarrow I = mR^2 \Rightarrow$ Δακτύλιος

ΘΕΜΑ Γ'




$t = t_1$

Γ1) $y = 2A\,\sigma\upsilon\nu\left(\frac{2\pi x}{\lambda}\right)\eta\mu\left(\frac{2\pi t}{T}\right)$

$y = 0,02\,\sigma\upsilon\nu\left(\frac{2\pi x}{0,8}\right)\eta\mu\left(\frac{2\pi t}{0,4}\right)$

$\boxed{y = 0,02\,\sigma\upsilon\nu(2,5\pi x)\,\eta\mu(5\pi t)\ \ (S.I)}$

Σχήμα : $2A = 0,02\,m$

$\lambda = 0,8\,m$

Ισχύει $\Delta t = \frac{T}{4} \Rightarrow 0,1 = \frac{T}{4} \Rightarrow T = 0,4\,sec$

Γ2) $U_\Sigma = \omega \cdot 2A\,\sigma\upsilon\nu(2,5\pi x_\Sigma)\,\sigma\upsilon\nu(5\pi t)$

$U_\Sigma = 5\pi \cdot 0,02\,\sigma\upsilon\nu(2,5\pi \cdot 0,8)\,\sigma\upsilon\nu(5\pi \cdot 1,05)$

$U_\Sigma = 0,1\pi \cdot \underbrace{\sigma\upsilon\nu(2\pi)}_{1}\,\sigma\upsilon\nu(5,25\pi)$

$U_\Sigma = 0,1\pi\,\sigma\upsilon\nu\left(4\pi + \frac{5\pi}{4}\right)$

$U_\Sigma = 0,1\pi\,\sigma\upsilon\nu\left(\pi + \frac{\pi}{4}\right)$

$U_\Sigma = -0,1\pi\,\sigma\upsilon\nu\left(\frac{\pi}{4}\right) \Rightarrow U_\Sigma = -0,1\pi\,\frac{\sqrt{2}}{2} \Rightarrow \boxed{U_\Sigma = -0,05\sqrt{2}\,\pi\ m/s}$

$\omega = \frac{2\pi}{T}$

$\omega = \frac{2\pi}{0,4}$

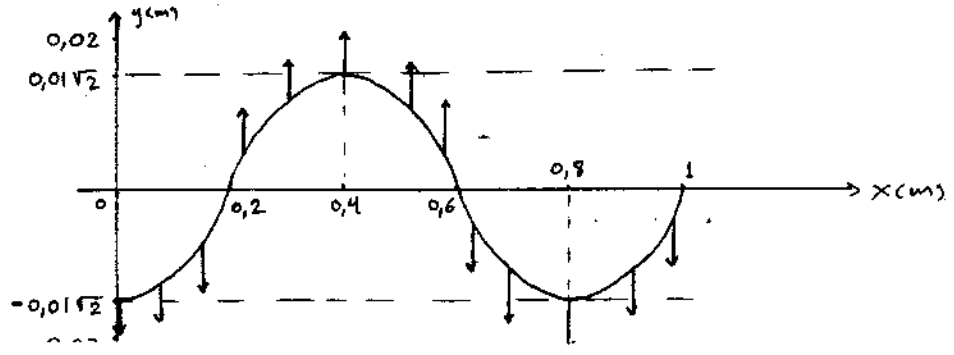
$\omega = 5\pi\ rad/s$

Γ3) $y_o = 0,02 \cdot \sigma\upsilon\nu(2,5\pi x_o) \cdot \eta\mu(5\pi \cdot 1,05)$

$y_o = 0,02 \cdot \underbrace{\sigma\upsilon\nu(2,5\pi \cdot 0)}_{1}\,\eta\mu(5,25\pi)$

$y_o = 0,02\,\eta\mu\left(\pi + \frac{\pi}{4}\right) \Rightarrow y_o = -0,02\,\eta\mu\left(\frac{\pi}{4}\right) \Rightarrow y_o = -0,02\,\frac{\sqrt{2}}{2} \Rightarrow y_o = -0,01\sqrt{2}\,m$

· Επειδή μεταξύ 0,2 παρεμβάλλονται 2 δεσμοί τα σημεία αυτά έχουν ίδια φορά κίνησης, άρα την $t_2 = 1,05\,sec$ ισχύει $U_o < 0$



Γ4) Αρχικά: $x_z = \lambda$

Τελικά: $x_z = (2N+1)\frac{\lambda'}{4}$ ($z$: δεσμός συμβ.) $\xrightarrow{(N=1)}$ $x_z = \frac{3\lambda'}{4}$

$\Rightarrow \lambda = \frac{3}{4}\lambda' \Rightarrow \frac{u_{κυμ}}{f} = \frac{3}{4}\frac{u_{κυμ}}{f'}$

$\Rightarrow f' = \frac{3}{4}f \Rightarrow f' = \frac{3}{4}\cdot\frac{5}{2} \Rightarrow f' = \frac{15}{8}$ Hz

$f = \frac{1}{T}$

$f = \frac{1}{0,4}$

$f = 2,5$ Hz

άρα $\Delta f = f' - f \Rightarrow \Delta f = \frac{15}{8} - \frac{5}{2} \Rightarrow \Delta f = \frac{15}{8} - \frac{20}{8}$

$\Rightarrow \Delta f = -\frac{5}{8} \Rightarrow \boxed{\Delta f = -0,625\ Hz}$

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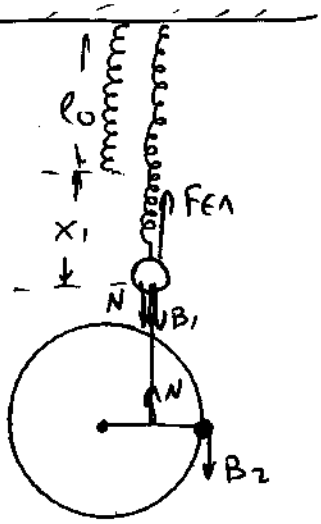
## ΘΕΜΑ Δ




Δ Α) $\Sigma\tau = 0 \Rightarrow m_2 g R - N\frac{R}{2} = 0 \Rightarrow N = 2m_2 g \Rightarrow \boxed{N = 2N_1}$

$\Sigma F = 0 \Rightarrow F_{ελ} = N + B_1 \Rightarrow K\cdot x_1 = N + m_1 g \Rightarrow$

$\Rightarrow \boxed{x_1 = 0,3\ m}$

$U_{ελ} = \frac{1}{2}K x_1^2 \Rightarrow \boxed{U_{ελ} = 0,45\ J}$

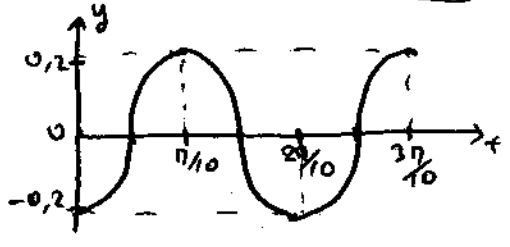
Δ Β1) ΘΙ $\Rightarrow \Sigma F = 0 \Rightarrow m_1 g = K x_2 \Rightarrow \boxed{x_2 = 0,1\ m}$

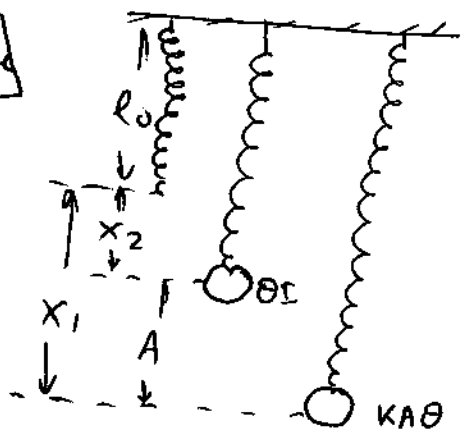
$A = x_1 - x_2 \Rightarrow \boxed{A = 0,2\ m}$ $\quad T = 2\pi\sqrt{\frac{m_1}{K}} \Rightarrow \boxed{T = \frac{2\pi}{10}\ sec}$

$\omega = \frac{2\pi}{T} \Rightarrow \boxed{\omega = 10\ rad/s}$

$y = A\eta\mu(\omega t + \varphi_0) \xrightarrow[y=-A]{t_0=0} \eta\mu\varphi_0 = -1 \Rightarrow \boxed{\varphi_0 = \frac{3\pi}{2}}$

$\boxed{y = 0,2\eta\mu(10t + \frac{3\pi}{2})}$



ΔΒ2) Το σώμα αρχικά θα κινηθεί προς τα δεξιά οπότε θα περάσει από τη θέση για 2η φορά όταν θα κατεβαίνει οπότε η ταχύτητα υ θα είναι αρνητική.

$$\upsilon^2 = \omega^2(A^2 - x^2) \Rightarrow \upsilon = \pm\omega\sqrt{A^2 - x_2^2} \xrightarrow{\upsilon<0} \boxed{\upsilon = -\sqrt{3}\ m/s}$$

$$\frac{dP}{dt} = \Sigma F = F_{\epsilon\pi} = -Dx_2 = -K\cdot x_2 \Rightarrow \boxed{\frac{dP}{dt} = -10\ N}$$

$$\frac{dK}{dt} = \Sigma F\cdot\upsilon = -K\cdot x_2\cdot\upsilon \Rightarrow \boxed{\frac{dK}{dt} = \sqrt{3}\ J/s}$$

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ΔΒ3) $I_{o\lambda} = I_{\delta\iota\sigma\kappa} + I_{m_2} = \frac{1}{2}MR^2 + m_2R^2 \Rightarrow \boxed{I_{o\lambda} = 0{,}25\ kg\,m^2}$

$$\Sigma\tau = I_{o\lambda}\cdot a_{\gamma\omega} \Rightarrow m_2gR = I_{o\lambda}\cdot\frac{d\omega}{dt} \Rightarrow \frac{d\omega}{dt} = \frac{m_2gR}{I_{o\lambda}}$$

$$\Rightarrow \boxed{\frac{d\omega}{dt} = 2\ rad/s^2}$$

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ΔΒ4) $A\Delta M\Sigma \Rightarrow U^{\beta\alpha\rho}_{\alpha\rho\chi} + K^{\sigma\tau\rho}_{\alpha\rho\chi} = U^{\beta\alpha\rho}_{\tau\epsilon\lambda} + K^{\sigma\tau\rho}_{\tau\epsilon\lambda}$

$$\Rightarrow m_2gR + 0 = 0 + \frac{1}{2}I_{o\lambda}\omega^2 \Rightarrow$$

$$\omega = \sqrt{\frac{2\cdot m_2\cdot g\cdot R}{I_{o\lambda}}} = \sqrt{4} \Rightarrow \boxed{\omega = 2\ rad/s}$$

$$L = I_{o\lambda}\omega \Rightarrow \boxed{L = 0{,}5\ kg\frac{m^2}{s^2}}$$