12/06/2023

Παρατηρήσεις

ΘΕΜΑ Α

Α1 β **Α2** δ **Α3** β **Α4** α

Α5 α) Λ β) Σ γ) Σ δ) Λ ε) Λ

ΘΕΜΑ Β

Β1 Σωστή απάντηση: (i)

$\phi = \frac{2\pi t}{T} - \frac{2\pi x}{\lambda}$

$x=0 \rightarrow 4\pi = \frac{2\pi \cdot 2}{T} \Rightarrow T = 1s$

$x=4m \rightarrow 0 = \frac{2\pi \cdot 2}{1} - \frac{2\pi \cdot 4}{\lambda} \Rightarrow \lambda = 2m$

$\Rightarrow v = \frac{\lambda}{T} = 2m/s$

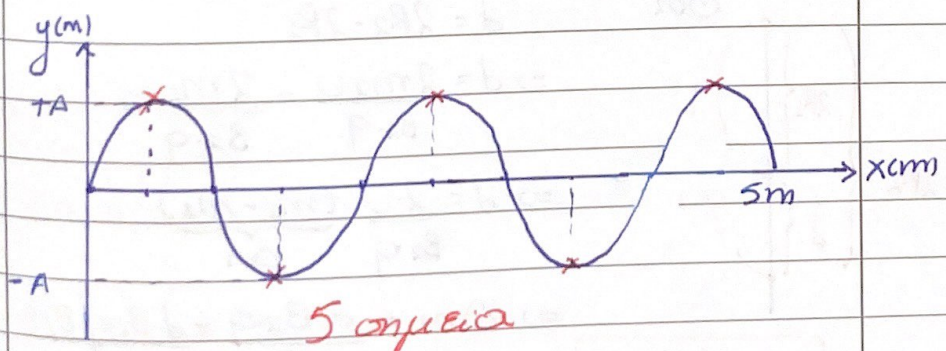
$y = A \cdot \eta\mu\left(\frac{2\pi t}{T} - \frac{2\pi x}{\lambda}\right) = A \cdot \eta\mu(2\pi t - \pi \cdot x)$

$\xrightarrow[t_2 = 2,5s]{x=0} y = A \cdot \eta\mu 5\pi \Rightarrow y = 0$

$\xrightarrow[t_2 = 2,5s]{x=\lambda/4} y = A \cdot \eta\mu\left(5\pi - \frac{\pi}{2}\right) = A \cdot \eta\mu 4,5\pi = +A$

$\rightarrow x = v \cdot t_2 = 2 \cdot 2,5 = 5m$

$\rightarrow \frac{x}{\lambda/4} = \frac{5}{1/2} = 10$



5 σημεία

Παρατηρήσεις

B2 Σωστή απάντηση: (ii)

Συχνότητα κατωφλίου: $f_1 = \frac{\Phi}{h}$

$\Rightarrow \boxed{\Phi = h \cdot f_1}$

Ο.Μ.Κ.Ε. (Καθόδο σε ανόδο):

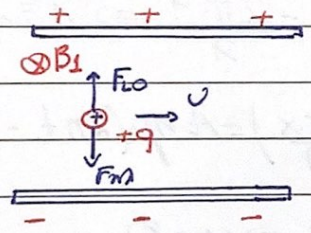
$0 - K_{max} = -e \cdot V_0 \Rightarrow K_{max} = e \cdot V_0$

$K_{max} = h \cdot f_2 - \Phi \Rightarrow e \cdot V_0 = h \cdot 3f_1 - h \cdot f_1$

$\Rightarrow e \cdot V_0 = 2 \cdot h \cdot f_1 \Rightarrow \boxed{V_0 = \frac{2hf_1}{e}}$

B3 Σωστή απάντηση: (ii)

α)

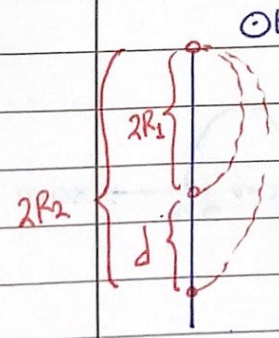


$\Sigma F = 0 \Rightarrow F_{Lo} = F_m \Rightarrow B_1 \upsilon q = \epsilon \cdot |q|$

$\Rightarrow \boxed{\upsilon = \frac{\epsilon}{B_1}}$

Σωστή απάντηση: (i)

β)



$d = 2R_2 - 2R_1$

$\Rightarrow d = \frac{2m_2\upsilon}{B_2 q} - \frac{2m_1 \cdot \upsilon}{B_2 q}$

$\Rightarrow d = \frac{2 \cdot \upsilon}{B_2 q}(m_2 - m_1)$, $(m_2 - m_1) = \Delta m$

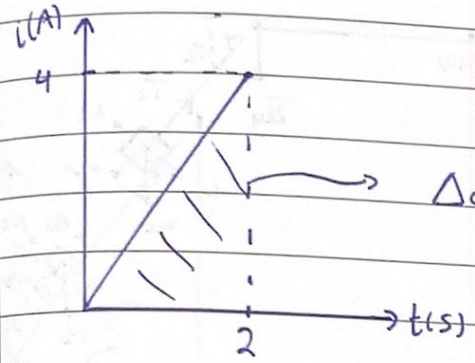
$\Rightarrow \Delta m = \frac{d \cdot B_2 q}{2\upsilon} = \frac{d \cdot B_2 q}{2\frac{\epsilon}{B_1}}$

$\Rightarrow \boxed{\Delta m = \frac{d \cdot B_1 \cdot B_2 \cdot q}{2\epsilon}}$

Παρατηρήσεις

ΘΕΜΑ Γ

Γ1 $i = 2 \cdot t$

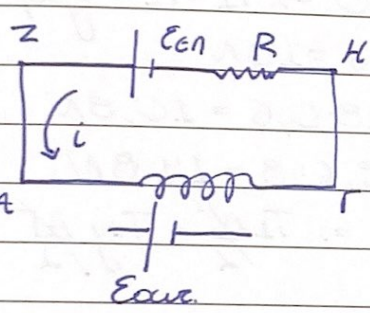


t	0	2
i	0	4

$\Delta q = E = \frac{4 \cdot 2}{2} \Rightarrow \boxed{\Delta q = 4C}$

$\frac{\Delta i}{\Delta t} = \frac{i_{τελ} - i_{αρχ}}{t_{τελ} - t_{αρχ}} = \frac{4-0}{2-0} \Rightarrow \boxed{\frac{\Delta i}{\Delta t} = 2 A/s}$

Γ2



$|E_{αυτ}| = L \cdot \left|\frac{\Delta i}{\Delta t}\right|$

$\Rightarrow |E_{αυτ}| = 0,5 \cdot 2$

$\Rightarrow \boxed{|E_{αυτ}| = 1V}$

Γ3 $i = \frac{E_{επ} - |E_{αυτ}|}{R_{ολ}} \Rightarrow i \cdot R_{ολ} = E_{επ} - |E_{αυτ}|$

$\Rightarrow B \cdot \upsilon \cdot l = |E_{αυτ}| + i \cdot R_{ολ}$

$\Rightarrow 1 \cdot \upsilon = 1 + 2 \cdot t \Rightarrow \boxed{\upsilon = 1 + 2 \cdot t}$ $\left.\begin{array}{l} \\ \upsilon = \upsilon_0 + \alpha \cdot t \end{array}\right\} \Rightarrow \alpha = 2 m/s^2$

Γ4 α) $t_1 = 2s$

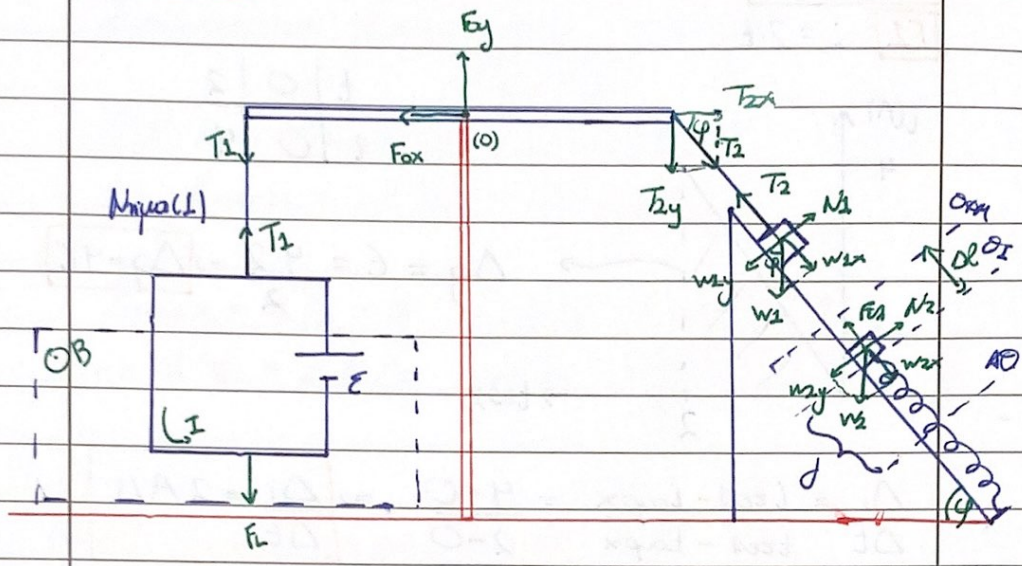
$i = 2 \cdot t = 4A \rightarrow F_L = B \cdot i \cdot L = 4N$

$\Sigma F = m\alpha \Rightarrow F - F_L - mg = m\alpha \Rightarrow F = 4 + 5 + 1 \Rightarrow \boxed{F = 10N}$

β) $\upsilon = 1 + 2 \cdot t = 5 m/s \rightarrow P_F = F \cdot \upsilon \Rightarrow \boxed{P_F = 50 J/s}$

γ) $\frac{dU_B}{dt} = |E_{αυτ}| \cdot i \Rightarrow \boxed{\frac{dU_B}{dt} = 4 J/s}$

ΘΕΜΑ Δ



Δ1) Σ_1: $\Sigma F_x = 0 \Rightarrow T_2 = w_{1x} = m_1 g \eta\mu\varphi$

$\Rightarrow T_2 = 30 \cdot 0{,}6 = 18N$

$T_{2y} = T_2 \cdot \eta\mu\varphi = 18 \cdot 0{,}6 = 10{,}8N$

$T_{2x} = T_2 \cdot \sigma\upsilon\nu\varphi = 18 \cdot 0{,}8 = 14{,}4N$

Ράβδος: $\Sigma\tau_{(O)} = 0 \Rightarrow T_1 \frac{\Delta\ell}{2} = T_{2y} \frac{\Delta\ell}{2}$

$\Rightarrow \boxed{T_1 = 10{,}8N}$

Δ2) Πλαίσιο: $\Sigma F = 0 \Rightarrow T_1 = F_L = 10{,}8N$

$I = \frac{\varepsilon}{R_{ολ}} = \frac{30}{2} = 15A$

$F_L = B \cdot I \cdot \alpha \Rightarrow 10{,}8 = B \cdot 15 \cdot 0{,}8 \Rightarrow \boxed{B = 0{,}9T}$

Δ3) $\Sigma F_{2x} = 0 \Rightarrow F_{ελ} = w_{2x} \Rightarrow k \cdot \Delta\ell = m_2 g \eta\mu\varphi$

$\Rightarrow \Delta\ell = \frac{10 \cdot 0{,}6}{100} = 0{,}06m$

$\rightsquigarrow$ Θ.Ι: $U_2 = U_{max} = \omega_2 \cdot d = \sqrt{\frac{k}{m_2}} \cdot d = \frac{9\pi}{10}\ m/s$

Σε χρόνο $\Delta t = \frac{T_2}{4} = \frac{2\pi}{4\omega_2} = \frac{\pi}{20}$ s,

το Σ_1 εκτελεί Ε.Ο.Ε.Τ. κ.

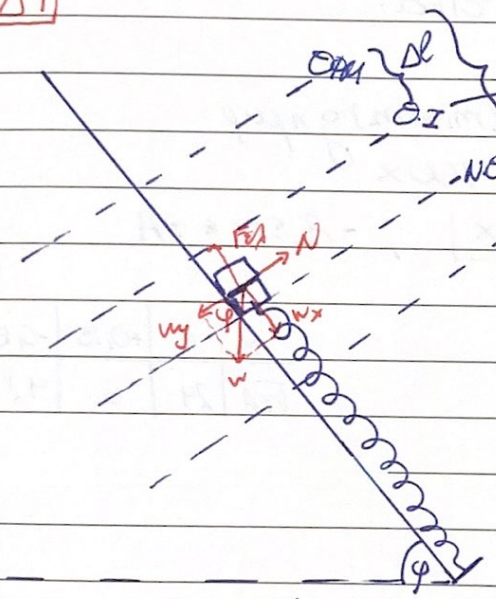
$\Sigma F_1 = m_1 \cdot a_1 \Rightarrow m_1 g \eta\mu\varphi = m_1 \cdot a_1 \Rightarrow a_1 = 6 m/s^2$

$U_1 = a_1 \cdot \Delta t = \frac{3\pi}{10}$ m/s

Α.Δ.Ο.: $m_1 U_1 - m_2 U_2 = (m_1 + m_2) U_k$

$\Rightarrow 3 \cdot \frac{3\pi}{10} - 1 \cdot \frac{9\pi}{10} = 4 U_k \Rightarrow \boxed{U_k = 0}$

Δ4



Ν.Θ.Ι

$\Sigma F_x = 0$

$\Rightarrow k \cdot \Delta l' = (m_1 + m_2) g \eta\mu\varphi$

$\Rightarrow \Delta l' = \frac{40 \cdot 0{,}6}{100} = 0{,}24 m$

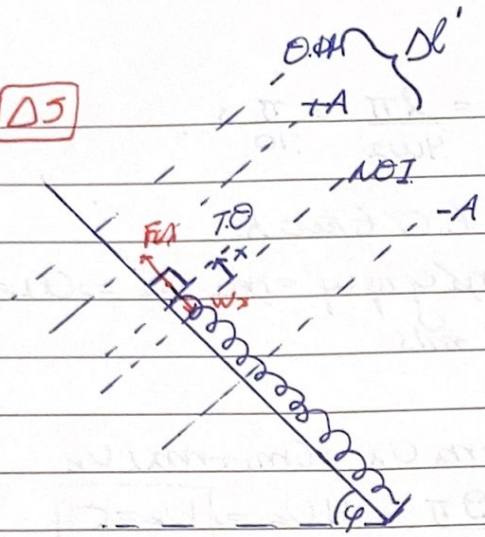
Άρα: $A = \Delta l' - \Delta l = 0{,}24 - 0{,}06 \Rightarrow A = 0{,}18 m$

$\omega = \sqrt{\frac{k}{m_1 + m_2}} = 5$ rad/s

$t = 0 \rightarrow x = +A \rightarrow \varphi_0 = \frac{\pi}{2}$ rad

$x = A \cdot \eta\mu(\omega t + \varphi_0) \Rightarrow \boxed{x = 0{,}18 \cdot \eta\mu(5t + \frac{\pi}{2}) (S.I.)}$

ΔΣ



Σε Τ.Θ. και θετικά:

$\Sigma F = F_{ελ} - W_x$

$\Rightarrow -D \cdot x = F_{ελ} - (m_1+m_2) \cdot g \cdot ημφ$

$\Rightarrow F_{ελ} = 40 \cdot 0,6 - 100x$

$\Rightarrow \boxed{F_{ελ} = 24 - 100x}$, $-A \leq x \leq +A$

x	0	$+0,18$	$-0,18$
$F_{ελ}$	24	6	42