ΑΠΑΝΤΗΣΕΙΣ

ΘΕΜΑ Α

Α1) β Α2) δ Α3) β Α4) α

Α5) α) Λ , β) Σ , γ) Σ , δ) Λ , ε) Λ

ΘΕΜΑ Β

Β1) Σωστο το (i)

$\Phi = 2\pi\left(\frac{t}{T} - \frac{x}{\lambda}\right)$ για $t_1 = 2s$

$\Phi = \frac{4\pi}{T} - \frac{2\pi x}{\lambda}$

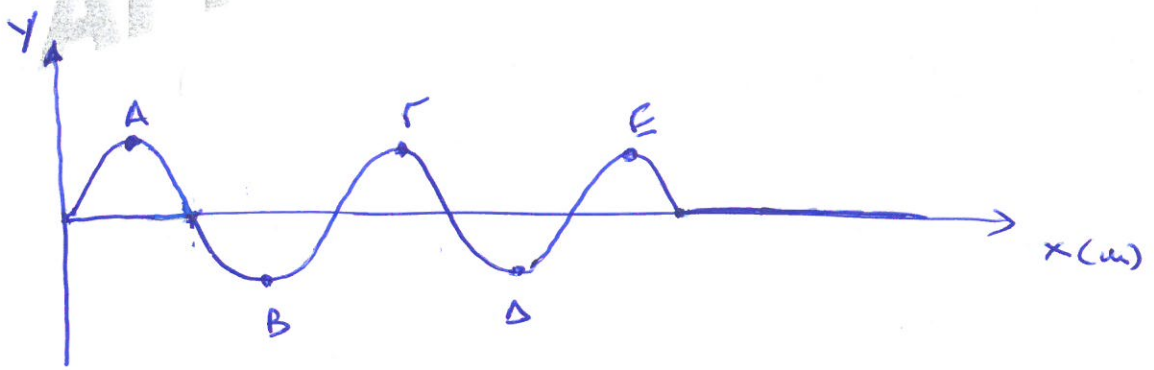
$(0, 4\pi)$: $4\pi = \frac{4\pi}{T} \Rightarrow \boxed{T = 1s}$

$(4, 0)$: $0 = \frac{4\pi}{1} - \frac{2\pi 4}{\lambda} \Rightarrow \boxed{\lambda = 2m}$

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

$U = \frac{x_2}{t_2} \Rightarrow \boxed{x_2 = 5m}$

Το κύμα έχει διαδοθεί κατά $x_2 = 5m$



$\frac{x_2}{\lambda} = \frac{5}{2} = 2,5 \Rightarrow x_2 = 2,5\lambda$

Από το διάγραμμα υπάρχουν 5 σημεία (Α, Β, Γ, Δ, Ε)

B_2) Σωστό το (ii)

$f_1 = f_0$, $f_2 = 3f_1$

$K_e = hf - \phi$ για $K = 0$ $\Big\}$ $0 = hf_0 - \phi \Rightarrow \phi = hf_0$

$\Rightarrow \phi = hf_1$ (1)

Ισχύει $K_e = hf_2 - \phi \Rightarrow K_e = h3f_1 - hf_1 \Rightarrow$

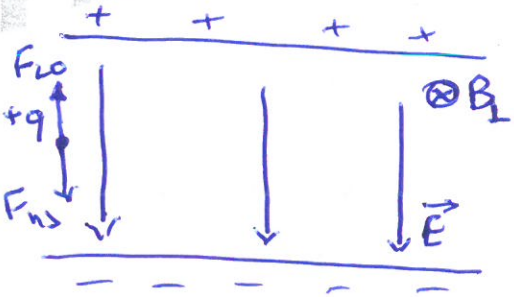
$K_e = 2hf_1$ (2)

ΘΜΚΕ

$K_T^{\not 0} - K_A = \Sigma W \Rightarrow -K_e = -eV_0 \Rightarrow \boxed{V_0 = \frac{2hf_1}{e}}$

B_3) α) Σωστό το (ii)

Για να μην εκτρέπεται θα πρέπει $\Sigma F = 0 \Rightarrow F_{L0} - F_{\Sigma\Omega} = 0$



$B_1 v|q| = E \cdot |q| \Rightarrow \boxed{v = \frac{E}{B_1}}$

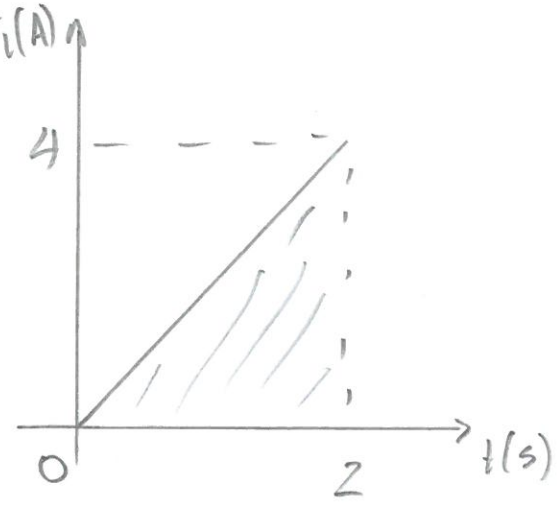
β) Σωστό το (i)

$R_1 = \frac{m_1 v}{B_2 q}$, $R_2 = \frac{m_2 v}{B_2 q}$ $\Big\}$ $d = 2R_2 - 2R_1 \Rightarrow \frac{d}{2} = R_2 - R_1 \Rightarrow$

$\frac{d}{2} = \frac{m_2 v}{B_2 q} - \frac{m_1 v}{B_2 q} \Rightarrow \frac{(m_2 - m_1)v}{B_2 q} = \frac{d}{2} \Rightarrow$

$\Rightarrow \Delta m = \frac{d B_2 q}{2v} \Rightarrow \boxed{\Delta m = \frac{d B_2 q B_1}{2E}}$

#/#

Γ1] 

$\frac{\Delta i}{\Delta t}$ = κλίση (i-t) = 2 A/s

q = Εμβαδό (i-t) = 4 C

Γ2] 

Επειδή το ρεύμα στο κύκλωμα αυξάνεται, το πηνίο αναπτύσσει πολικότητα για να αντιτίθεται στην αύξηση του ρεύματος (Lenz)

$|\mathcal{E}_{AVT}| = L \cdot \frac{\Delta i}{\Delta t} = 0,5 \cdot 2 = 1 Volt$

Γ3] Σύμφωνα με 2ο Κ.Κ.: $i = \frac{\mathcal{E} - \mathcal{E}_{AVT}}{R_{ολ}} \Rightarrow$

$2 \cdot t = \frac{B \cdot \upsilon \cdot \ell - 1}{1} \Rightarrow 2t = \upsilon - 1 \Rightarrow \upsilon = 1 + 2t$ (SI)

Γ4] Λόγω $\upsilon = 1 + 2t$ και $\upsilon = \upsilon_0 + at$ προκύπτει

$\upsilon_0 = 1 m/s$ και $a = 2 m/s^2$

α) $F_L = B \cdot i \cdot \ell = 1 \cdot 2 \cdot t_1 \cdot 1 = 2t_1 = 4N$

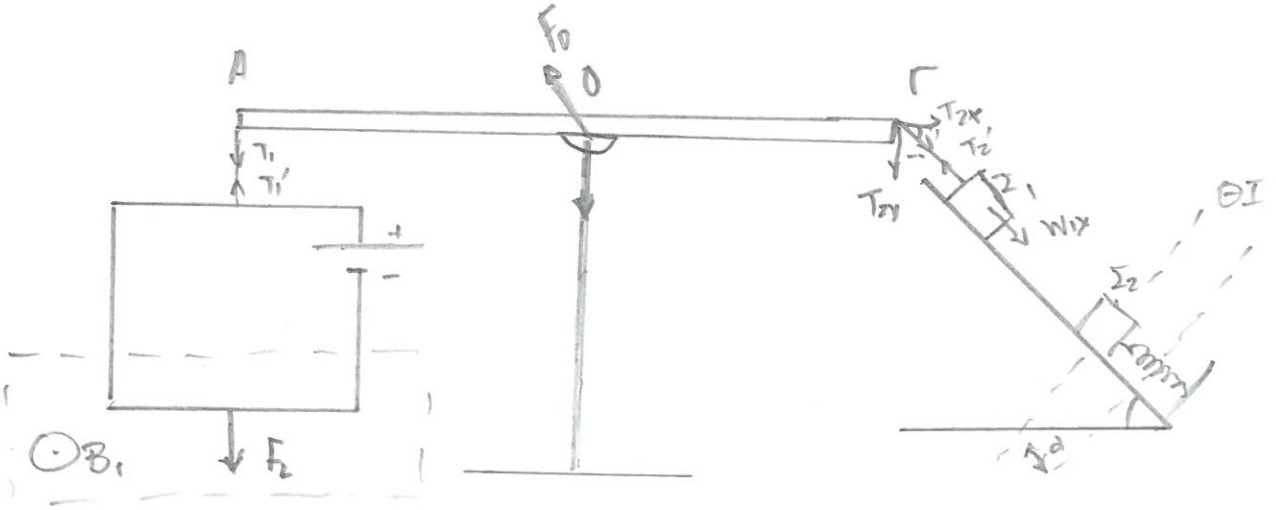
$\Sigma F = m \cdot a \Rightarrow F - F_L - W = ma \Rightarrow F = m \cdot g + F_L + m \cdot a$

$\Rightarrow F = 6 + 2t$; για $t_1 = 2 sec$ $F = 10N$

β) $P_F = F \cdot \upsilon = 10(1 + 2t_1) = 10 \cdot 5 = 50$ Watt ή J/s

γ) $\frac{\Delta U_B}{\Delta t} = P_L = \mathcal{E}_{AVT} \cdot i = 1 \cdot 2 \cdot t = 4$ J/s ή Watt

ΘΕΜΑ Δ



Δ1] • Το σώμα Σ_1 ισορροπεί: $\Sigma F_1 = 0 \Rightarrow W_{1x} = T_2' \Rightarrow$

$\Rightarrow m_1 \cdot g \cdot \eta\mu 37° = T_2' \Rightarrow T_2' = 3 \cdot 10 \cdot \frac{3}{5} = 18N$

• $T_2' = T_2 = 18N$ (αβαρές νήμα)

• Η ράβδος ισορροπεί: $\Sigma \tau_{F(O)} = 0 \Rightarrow \tau_{T_{2x}}^{0} + \tau_{T_{2y}} + \tau_{F_0}^{0} + \tau_{T_1} = 0$

$\Rightarrow T_1 \cdot \frac{L}{2} = T_{2y} \cdot \frac{L}{2} \Rightarrow T_1 = T_2 \cdot \eta\mu 37° \Rightarrow T_1 = 18 \cdot \frac{3}{5}$

$\Rightarrow T_1 = \frac{54}{5} N = 10,8N$, $T_1 = T_1' = 10,8N$

Δ2] Το πλαίσιο ισορροπεί: $\Sigma F_{πλαίσιο} = 0 \Rightarrow$

$\Rightarrow F_L = T_1' \Rightarrow B I^* \alpha = 10,8 \Rightarrow B = \frac{10,8}{12} = 0,9T$

* $I = \frac{\mathcal{E}}{R_{ολ}} = \frac{30}{2} = 15A$

Δ_3]. Θα πρέπει ν.δ.ό. $U_K = 0$

• $U_2 = U_{max} = \omega A \xrightarrow[\text{αφήνω ελεύθερο}]{A=d} \sqrt{\frac{k}{m_2}}\, d = \sqrt{\frac{100}{1}}\,\frac{9\pi}{100} = \frac{9\pi}{10}$ m/s

• Για πρώτη φορά ισχύει ότι $t = \frac{T}{4} = \frac{\pi}{20}$ sec

$$T = \frac{2\pi}{\omega} = \frac{2\pi}{10} = \frac{\pi}{5} \text{ sec}$$

• Το Σ_1 εκτελεί ευθ. αμ. επιταχ. με

$$\Sigma F_{1x} = m_1 \cdot a_1 \Rightarrow W_{1x} = m_1 \cdot a_1 \Rightarrow m_1 g \cdot \eta\mu 37^\circ = m_1 \cdot a_1$$

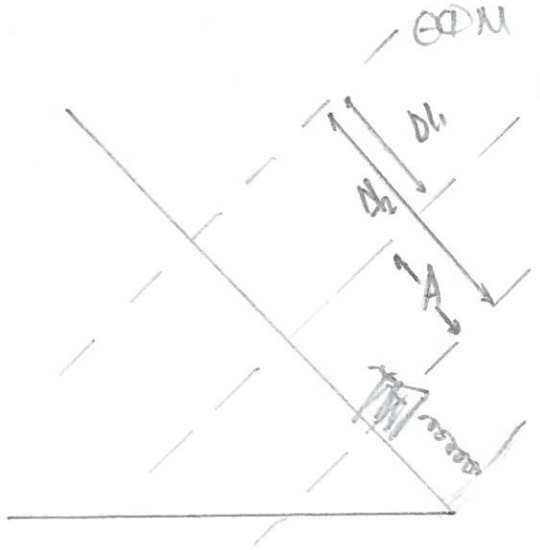
$$\Rightarrow 10 \cdot \frac{3}{5} = a_1 \Rightarrow a_1 = 6\, m/s^2$$

$$U_1 = a_1 \cdot t = 6 \cdot \frac{\pi}{20} = \frac{3\pi}{10} \text{ sec}$$

• ΑΔΟ: $\vec{P}_{\text{σ.σ.εξ}} = \vec{P}_{\text{σ.σ.(τελ)}} \Rightarrow U_K = \frac{m_2 U_{max} - m_1 U_1}{m_1 + m_2} = \frac{1 \cdot \frac{9\pi}{10} - 3\,\frac{3\pi}{10}}{4} \Rightarrow$

$$\Rightarrow U_K = 0$$

Δ4]



$\Theta I(m_2) = A\Theta(v_k = 0)$

$\Theta I(m_1+m_2)$

$\Theta I_2: \Sigma F_2 = 0 \Rightarrow$

$W_{2x} = F_{ed} \Rightarrow m_2 \cdot g \cdot \eta\mu\varphi = k\Delta l_1$

$\Rightarrow \Delta l_1 = \frac{6}{100} = 0{,}06\,m$

$\Theta I(m_1+m_2)$: $\Sigma F = 0 \Rightarrow W_{ολ(x)} = F_{ed}' \Rightarrow (m_1+m_2) g \eta\mu\varphi = k \cdot \Delta l_2$

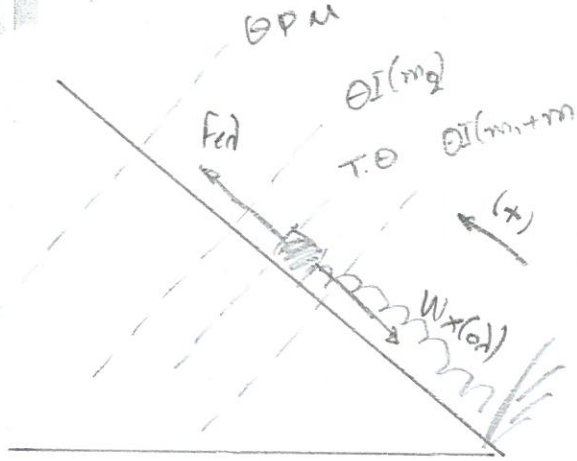
$\Rightarrow \Delta l_2 = \frac{4 \cdot 10 \cdot \frac{3}{5}}{100} = 0{,}24\,m$

$A = \Delta l_2 - \Delta l_1 = 0{,}24 - 0{,}06 = 0{,}18\,m$

Για $t_0 = 0$ ισχύει ότι $x = +A$, άρα $\varphi_0 = \frac{\pi}{2}\,rad$

$x = A \cdot \eta\mu(\omega t + \varphi_0) = 0{,}18 \cdot \eta\mu\left(5t + \frac{\pi}{2}\right)(SI).$

Δ5]

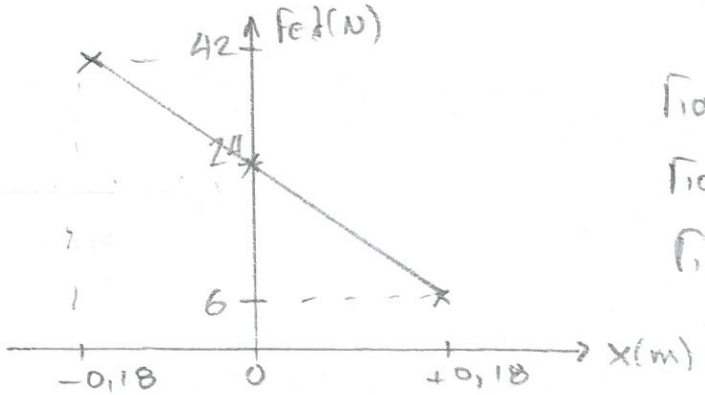


$\Sigma F = -Dx \Rightarrow$

$F_{ed} - (m_1+m_2) g \eta\mu 37^\circ = -kx$

$F_{ed} = 24 - 100x\ (SI)$

$x \in [-0{,}18\ ,\ 0{,}18]$



Για $x = 0{,}18\,m \rightarrow F_{ed} = 6N$

Για $x = 0 \rightarrow F_{ed} = 24N$

Για $x = -0{,}18\,m \rightarrow F_{ed} = 42N$

Καλά Αποτελέσματα

Καλό Μηχανογραφικό