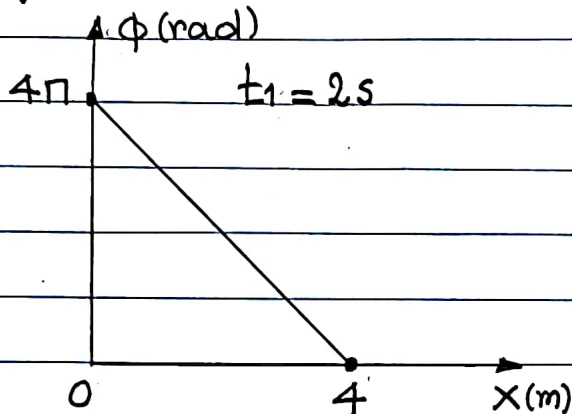


# ΘΕΜΑ Β

B1.  $y_0 = A \cdot \eta\mu(\omega t)$



$$\rightarrow y = A \eta\mu\left(\omega t - \frac{2\pi \cdot x}{\lambda}\right) \text{ (1) } \rightarrow$$

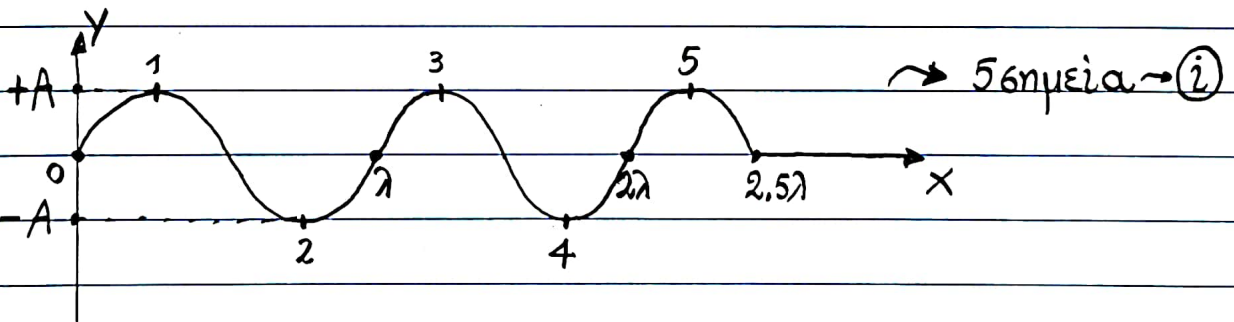
$$\rightarrow \phi = \omega \cdot t - \frac{2\pi \cdot x}{\lambda} \text{ (2) }$$

$$\phi \sim t: \phi(x=0, t_1) = 4\pi \text{ r } \stackrel{\text{(2)}}{\Rightarrow} \omega = 2\pi \text{ r/s} \sim T = 1 \text{ sec}$$

$$\phi(x=4\text{m}, t_1) = 0 \text{ άρα } 4\pi - \frac{2\pi \cdot 4}{\lambda} = 0 \Rightarrow \lambda = 2\text{m}$$

Άρα:  $y = A \cdot \eta\mu(2\pi t - \pi \cdot x)$  SI

$$t_2 = 2.5\text{s} = 2.5 \cdot T \rightarrow x_2 = 2.5 \cdot \lambda = 5\text{m.}$$



B2.  $f_0 = f_1$  αν  $f_2 = 3 \cdot f_1$  Τότε  $V_{\text{αποκροήσεως}} = V_0 = ?$

$$\begin{aligned} \text{Έχουμε } K &= h \cdot f_2 - \phi, \quad \} \Rightarrow K = 3h \cdot f_1 - h \cdot f_1 \Rightarrow K = 2h \cdot f_1 \\ \phi &= h \cdot f_1 \end{aligned}$$

$$\begin{aligned} \text{Τότε ΘΜΚΕ: } 0 - K &= (-e) \cdot (V_{\text{καθ}} - V_{\text{αν}}) \Rightarrow V_{\text{καθ}} - V_{\text{αν}} = K/e \Rightarrow \\ \Rightarrow V_0 &= \frac{2h \cdot f_1}{e} \rightarrow \text{(ii)} \end{aligned}$$

$$B3. \text{ Φ.Τ. : } \Sigma F = 0 \Rightarrow |F_{\text{net}}| = |F_y| \Rightarrow |q| \cdot E = B_1 v |q| \Rightarrow$$

$$\Rightarrow v = \frac{E}{B_1} \sim \textcircled{ii}$$

$$\left. \begin{array}{l} \text{ΜΕΤΑ: } d = 2 \cdot (R_2 - R_1) \\ \text{ΜΕ } R_1 = \frac{m_1 \cdot v}{|q| \cdot B_2}, \quad R_2 = \frac{m_2 \cdot v}{|q| \cdot B_2} \end{array} \right\} \Rightarrow d = \frac{(m_2 - m_1) \cdot 2 \cdot v}{|q| \cdot B_2} \Rightarrow$$
$$v = \frac{E}{B_1}$$

$$\Rightarrow d = \frac{\Delta m \cdot 2 \cdot E}{|q| \cdot B_1 \cdot B_2} \Rightarrow \Delta m = \frac{d \cdot B_1 \cdot B_2 \cdot |q|}{2 \cdot E} \sim \textcircled{i}$$

### ΘΕΜΑ Α

$$A1 \rightarrow B, \quad A2 \rightarrow \delta, \quad A3 \rightarrow B, \quad A4 \rightarrow A$$

$$A5: \Lambda, \Sigma, \Sigma, \Lambda, \Lambda$$

# ΘΕΜΑ Γ

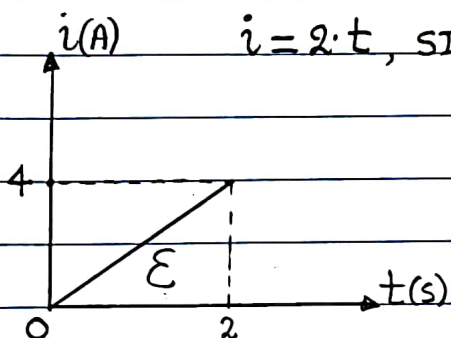
Πηvio:  $L = 0.5\text{H}$ ,  $R_0 = 0$

ZH:  $m = 0.5\text{kg}$ ,  $l = 1\text{m}$ ,  $R = 1\Omega$

F κατάλληλη,  $B = 1\text{T}$ ,  $\otimes$

$i = 2 \cdot t$ , SI  $\curvearrowright$

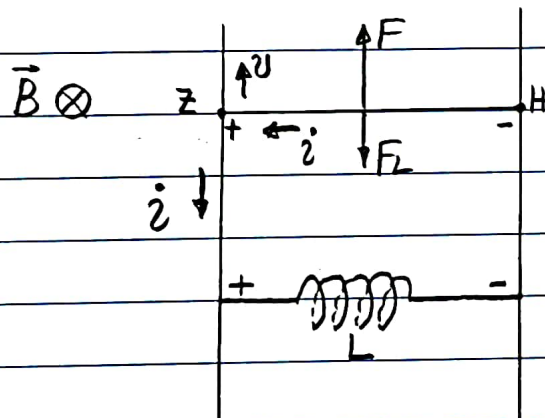
Γ1.



$$i = 2 \cdot t, \text{ SI} \leadsto \frac{\Delta i}{\Delta t} = +2 \text{ A/s} = 6 \text{ ταθ.}$$

$$\epsilon \leadsto \Delta q = \frac{2 \cdot 4}{2} \text{ C} \Rightarrow \Delta q = 4 \text{ C.}$$

Γ2.



$$\frac{\Delta i}{\Delta t} = +2 \text{ A/s} \xrightarrow{\text{Lenz}} \overset{i}{\rightarrow} \text{E}_{\text{out}}$$

$$k' |E_{\text{out}}| = L \cdot \left| \frac{\Delta i}{\Delta t} \right| \Rightarrow |E_{\text{out}}| = 1 \text{ V.}$$

Γ3. 2<sup>ος</sup> K.K.:  $E_{\text{em}} - |E_{\text{out}}| - i \cdot R = 0 \Rightarrow B \cdot v \cdot l = |E_{\text{out}}| + i \cdot R \Rightarrow$

$$\Rightarrow v = \frac{1}{Bl} [ |E_{\text{out}}| + i \cdot R ] \Rightarrow v = 1 + 2 \cdot t, \text{ SI} \quad (v_0 = 1 \text{ m/s}, a = 2 \text{ m/s}^2)$$

Γ4.  $t_1 = 2 \text{ s} : v_1 = (1 + 2 \cdot 2) \text{ m/s} \Rightarrow v_1 = 5 \text{ m/s}$   $k' i_1 = 4 \text{ A}$

τότε  $F_{L1} = B \cdot i_1 \cdot l \Rightarrow F_{L1} = 4 \text{ N}$

$\} \Rightarrow F_1 = 10 \text{ N}$

2<sup>ος</sup> N.N.:  $F_1 - F_{L1} - m \cdot g = m \cdot a \Rightarrow F_1 = m \cdot (a + g) + F_{L1}$

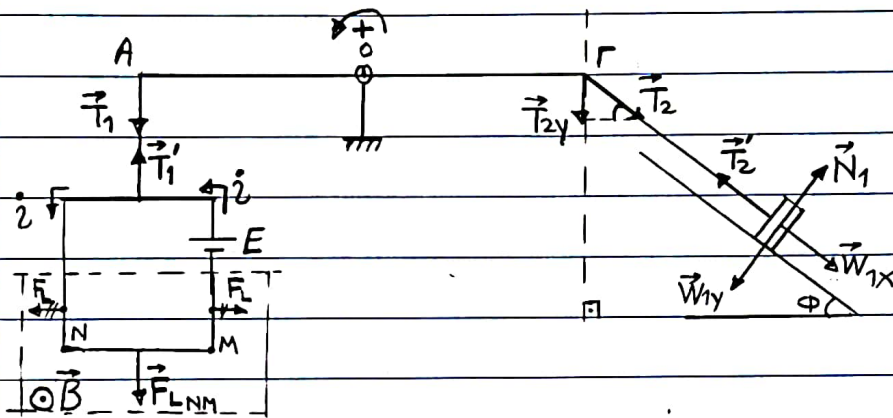
$$P_F = F_1 \cdot v_1 \Rightarrow P_F = +50 \text{ J/s}, \quad P_{\text{πnv}} = |E_{\text{out}}| \cdot i_1 \Rightarrow P_{\text{πnv}} = +4 \text{ J/s}$$



# ΘΕΜΑ Δ

ΚΛΜΝ:  $a = 0.8\text{m}$ ,  $R = 2\Omega$   
 $E = 30\text{V}$ ,  $r = 0$ ,  $\vec{B} \odot$

$\Sigma_1$ :  $m_1 = 3\text{kg}$  σε λείο κεκλιμένο,  $\phi = 37^\circ \rightarrow \eta\mu\phi = 0.6$   
 $\Sigma_2$ :  $m_2 = 1\text{kg}$   $\rightarrow k = 100\text{N/m}$



Δ1.  $T_1 = ?$

$$\Sigma F_x(m_1) = 0 \Rightarrow T_2' = W_{1x} = m_1 \cdot g \cdot \eta\mu\phi \xrightarrow[\text{νήμα}]{\text{αβαρής}} T_2 = T_2' = m_1 \cdot g \cdot \eta\mu\phi = 18\text{N}$$

$$\Sigma \tau_0 = 0 \Rightarrow T_1 \cdot \frac{l}{2} - T_{2y} \cdot \frac{l}{2} = 0 \Rightarrow T_1 = T_{2y} = T_2 \cdot \eta\mu\phi \Rightarrow$$

$$\Rightarrow T_1 = 10.8\text{N} = \frac{54}{5}\text{N}$$

Δ2.  $B = ?$

$$\Sigma F_{\text{μα}} = 0 \Rightarrow T_1' = F_{\text{LMN}} \xrightarrow[\text{νήμα}]{\text{αβαρής}} T_1 = B \cdot i \cdot a \quad \text{①}$$

$$i = E/R = 15\text{A} \quad \text{τότε } \text{①} \Rightarrow B = \frac{T_1}{i \cdot a} \Rightarrow B = 0.9\text{T}$$

Δ3.  $\Sigma F_x(m_1) = m_1 \cdot g \cdot \eta\mu\phi$  τότε  $|a_1| = g \cdot \eta\mu\phi = 6\text{m/s}^2$ .

$\Sigma_2$ : AAT με  $A = d = 9\pi \cdot 10^{-2}\text{m}$  κ'  $\omega = \sqrt{k/m_2} = 10\text{r/s} \rightarrow T = \frac{2\pi}{10}\text{s}$

$A \rightarrow \Theta\Gamma$  σε  $T/4 = \pi/20\text{s}$  κ'  $v_{\text{max1}} = \omega \cdot A = 0.9\pi\text{m/s}$ .

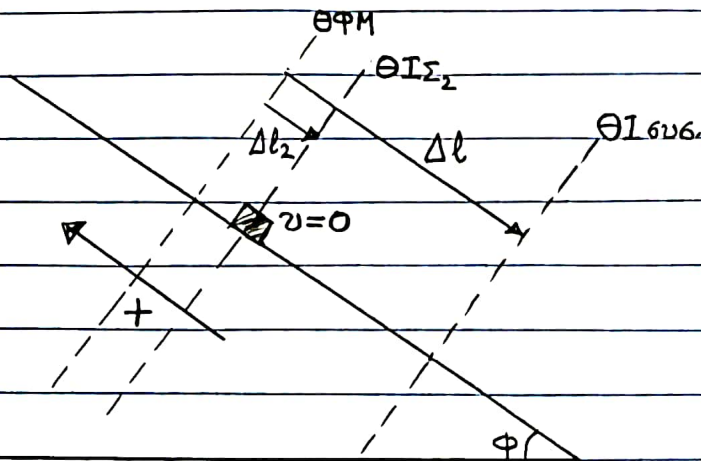
τότε  $|v_1| = |a_1| \cdot (T/4) \Rightarrow |v_1| = 0.3\pi\text{m/s}$  άρα  $|v_{\text{max1}}| = 3|v_1|$

$$\text{ΑΔΟ: } p_1 + p_2 = p_{\text{συσ}} \xrightarrow[m_1=3m_2]{\text{↑}}$$

$$-3m_2 \cdot |v_1| + m_2 \cdot 3|v_1| = p_{\text{συσ}} \Rightarrow$$

$$\Rightarrow p_{\text{συσ}} = 0$$

Δ4.



$$\Theta I \Sigma_2 : k \cdot \Delta l_2 = m_2 \cdot g \cdot \eta \mu \phi \Rightarrow \Delta l_2 = 6 \text{ cm}$$

$$\Theta I \Sigma_{\text{C.M.}} : k \cdot \Delta l = (m_1 + m_2) g \cdot \eta \mu \phi \stackrel{m_1 = 3m_2}{\Rightarrow} k \cdot \Delta l = 4m_2 \cdot g \cdot \eta \mu \phi \Rightarrow \Delta l = 4 \cdot \Delta l_2 = 24 \text{ cm.}$$

$$v_{\text{C.M.}} = 0 \text{ στην } \Theta I \Sigma_2 \text{ άρα } A_{\text{C.M.}} = \Delta l - \Delta l_2 = 3 \cdot \Delta l_2 = 18 \text{ cm}$$

$$\text{και } \omega_{\text{C.M.}} = \sqrt{\frac{k}{m_1 + m_2}} \Rightarrow \omega_{\text{C.M.}} = 5 \text{ r/s.}$$

$$t=0 : v_{\text{C.M.}} = 0 \text{ κ' } x = + A_{\text{C.M.}} \Rightarrow \phi_0 = \frac{\pi}{2} \text{ rad.}$$

$$\text{'Αρα : } x = 0.18 \cdot \eta \mu (5t + \frac{\pi}{2}), \text{ SI}$$

$$\Delta 5. \sum \vec{F}_{\text{C.M.}}(x) = -k \cdot \vec{x} \Rightarrow \vec{F}_{\text{ελ}} + \vec{W}_{\text{C.M.}} = -k \cdot \vec{x} \Rightarrow$$

$$\Rightarrow F_{\text{ελ}} - (m_1 + m_2)g \cdot \eta \mu \phi = -k \cdot x \Rightarrow F_{\text{ελ}} = 4m_2 g \eta \mu \phi - k \cdot x \Rightarrow$$

$$\Rightarrow F_{\text{ελ}} = 24 - 100 \cdot x, \text{ SI, } -0.18 \text{ m} \leq x \leq +0.18 \text{ m.}$$

$$x = -0.18 \text{ m} \rightsquigarrow F_{\text{ελ}} = +42 \text{ N, } x = +0.18 \text{ m} \rightsquigarrow F_{\text{ελ}} = +6 \text{ N.}$$

