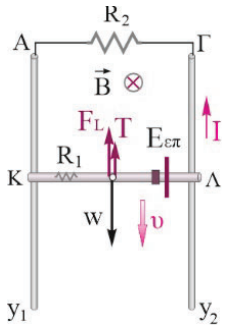
Λύσεις κριτηρίου 24

ΘΕΜΑ Α

Α1. (β) **Α2.** (γ) **Α3.** (α) **Α4.** (γ) **Α5.** α. Λ β. Σ γ. Λ δ. Λ ε. Σ

ΘΕΜΑ Β

Β1. (iii)



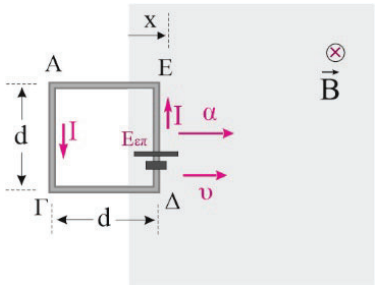
$$\Sigma F = 0 \Rightarrow mg - T - F_L = 0 \Rightarrow mg - \frac{mg}{4} - \frac{B^2L^2\upsilon}{4R} = 0 \Rightarrow$$

$$mg = \frac{B^2L^2\upsilon}{3R}$$

$$\left|\frac{dU_B}{dt}\right| = \frac{dW_w}{dt} = mg\upsilon \Rightarrow \left|\frac{dU_B}{dt}\right| = \frac{B^2L^2}{3R}\upsilon^2$$

$$P_2 = I^2R_2 = \left(\frac{E_{\varepsilon\pi}}{R_{o\lambda}}\right)^2 R_2 = \frac{B^2L^2\upsilon^2}{16R^2}3R = \frac{3B^2L^2\upsilon^2}{16R} \Rightarrow P_2 = \frac{9}{16}\left|\frac{dU_B}{dt}\right|$$

Β2. (i)



$$\Phi = B\Delta S = Bdx \Rightarrow \frac{Bd^2}{2} = Bdx \Rightarrow x = \frac{d}{2}$$

$$x = \frac{1}{2}\alpha t^2 \Rightarrow \frac{d}{2} = \frac{1}{2}\alpha t^2 \Rightarrow t = \sqrt{\frac{d}{\alpha}}$$

$$\upsilon = \alpha t = \sqrt{d\alpha}$$

$$E_{\varepsilon\pi} = B\upsilon d = Bd\sqrt{d\alpha}$$

$$V_{E\Delta} = E_{\varepsilon\pi} - IR = IR_{o\lambda} - IR = 4IR - IR = 3IR = \frac{3E_{\varepsilon\pi}}{4}$$

$$\Rightarrow V_{E\Delta} = \frac{3}{4}Bd\sqrt{d\alpha}$$

Β3. (ii)

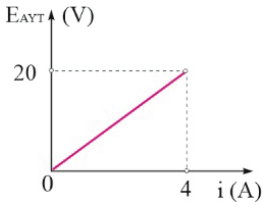
$$\frac{3}{2}T_1 = 2T_2 \Rightarrow T_2 = \frac{3}{4}T_1 \Rightarrow \frac{2\pi}{\omega_2} = \frac{3}{4}\frac{2\pi}{\omega_1} \Rightarrow \omega_1 = \frac{3}{4}\omega_2$$

$$V_1 = N\omega_1 BA \qquad V_2 = N\omega_2 BA \text{ , οπότε } V_1 = \frac{3}{4}V_2$$

$$I_2 = 2I_1 \Rightarrow \frac{V_2}{R_2} = 2\frac{V_1}{R_1} \Rightarrow \frac{V_2}{R_2} = 2\frac{3}{4}\frac{V_2}{R_1} \Rightarrow R_1 = 1{,}5R_2$$

ΘΕΜΑ Γ

Γ1. $I_0 = \dfrac{E}{R_1 + r} = 4A$, $U_{B,0} = \dfrac{1}{2} L I_0^2 = 1,6J$



Γ2. $|E_{AYT}| = iR_{ολ} = i(R_1 + R_2) \Rightarrow |E_{AYT}| = 5i \quad (SI)$

Γ3. $U_B = \dfrac{1}{4} U_{B,0} = 0,4J \Rightarrow \dfrac{1}{2} L i^2 = 0,4 \Rightarrow i = 2A$

$$|E_{AYT}| = iR_{ολ} = i(R_1 + R_2) \Rightarrow |E_{AYT}| = 10V \Rightarrow L\left|\frac{di}{dt}\right| = 10V \Rightarrow \left|\frac{di}{dt}\right| = 50A/s \Rightarrow \frac{di}{dt} = -50A/s$$

Γ4. $\dfrac{P_1}{P_L} = \dfrac{i^2 R_1}{|E_{AYT}| i} = \dfrac{iR_1}{iR_{ολ}} = \dfrac{R_1}{R_1 + R_2} \Rightarrow \dfrac{P_1}{P_L} = \dfrac{4}{5}$

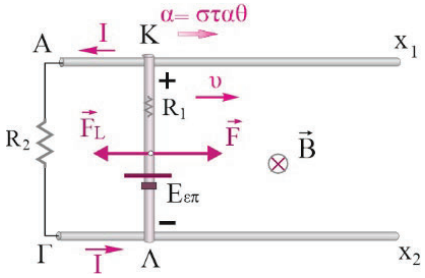
Γ5. $\dfrac{\Delta Q_1}{\Delta Q_2} = \dfrac{\Sigma i^2 R_1 \Delta t}{\Sigma i^2 R_2 \Delta t} = \dfrac{R_1}{R_2} \dfrac{\Sigma i^2 \Delta t}{\Sigma i^2 \Delta t} \Rightarrow \dfrac{Q_1}{Q_2} = \dfrac{R_1}{R_2} = 4 \Rightarrow Q_2 = \dfrac{1}{4} Q_1$

$$Q_{ολ} = U_{B,0} \Rightarrow Q_1 + Q_2 = 1,6 \Rightarrow \frac{5}{4} Q_1 = 1,6 \Rightarrow Q_1 = 1,28J$$

ΘΕΜΑ Δ

Δ1. $P_2 = i^2 R_2 = 1,2W \quad (1)$

$V_{KΛ} = V_{AΓ} = iR_2 = 0,6V \quad (2)$



Από (1) και (2) i=2A και R_2=0,3Ω

Δ2. $E_{επ} = iR_{ολ} \Rightarrow B\upsilon L = i(R_1 + R_2) \Rightarrow \upsilon = 4m/s$

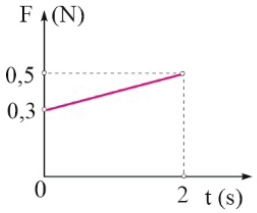
$\upsilon = \upsilon_0 + \alpha t_1 \Rightarrow t_1 = 2s$

Άρα, η μετατόπιση είναι: $\Delta x = \upsilon_0 t_1 + \dfrac{1}{2} \alpha t_1^2 = 6m$

Δ3. $i = \dfrac{E_{επ}}{R_{ολ}} = \dfrac{B\upsilon L}{R_{ολ}} = \dfrac{B(\upsilon_0 + \alpha t)L}{R_1 + R_2} \Rightarrow i = 1 + 0,5t(SI)$

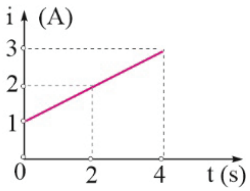
$\Sigma F = m\alpha \Rightarrow F - F_L = m\alpha \Rightarrow$

$F = F_L + m\alpha = BiL + m\alpha \Rightarrow F = 0,1t + 0,3(SI)$



Δ4. $P_F = F\upsilon = F(\upsilon_0 + \alpha t) = (0,1t + 0,3)(2 + 1t) = 4,2w \Rightarrow$

$t^2 + 5t - 36 = 0 \Rightarrow t = 4s$



$q \leftrightarrow$ εμβαδό $\Rightarrow q = \dfrac{2+3}{2} 2C = 5C$