

2012: Ενδεικτικές απαντήσεις

Θέμα 1ε Α-β, Β-δ, Γ-γ, Δ-α Ε. α-λ, β-ζ, γ-λ
δ-ζ, ε-λ

Θέμα 2ε Α.) $F = k_{\text{us}} \frac{|Q \cdot q|}{r_1^2}$
 $F' = k_{\text{us}} \frac{|Q \cdot q|}{r_2^2}$ $\left. \vphantom{\begin{matrix} F \\ F' \end{matrix}} \right\} \frac{F}{F'} = \frac{r_2^2}{r_1^2} \Rightarrow r_2 = r_1 \sqrt{\frac{F}{F'}} \Rightarrow$
 $r_2 = 5 \text{ m.}$

Β.) $R_1 = \frac{\rho l_1}{s_1}$
 $R_2 = \frac{\rho l_2}{s_2}$ $\left. \vphantom{\begin{matrix} R_1 \\ R_2 \end{matrix}} \right\} \frac{R_1}{R_2} = \frac{l_1 s_2}{l_2 s_1} = 3 \cdot \frac{1}{6} = \frac{1}{2}.$

Θέμα 3ε Α.) $V_1 = k_{\text{us}} \frac{Q}{r_1} = 9 \cdot 10^9 \frac{2 \cdot 10^{-6}}{2} = 9 \cdot 10^3 \text{ V}$
 $V_2 = k_{\text{us}} \frac{Q}{r_2} = 4,5 \cdot 10^3 \text{ V.}$

Β.) $U = q \cdot V_1 = 10^{-6} \cdot 9 \cdot 10^3 = 9 \cdot 10^{-3} \text{ J.}$

Γ.) $F = k_{\text{us}} \frac{|Q \cdot q|}{r_1^2} = 4,5 \cdot 10^{-3} \text{ N.}$

Δ.) $W = q(V_1 - V_2) = 10^{-6} (9 - 4,5) \cdot 10^3 = 4,5 \cdot 10^{-3} \text{ J.}$

Θέμα 4ε Α.) $R_{\text{Ar}} = \frac{R_1 R_2}{R_1 + R_2} + R_2 = \frac{60 \cdot 20}{80} + 10 = 25 \Omega$

Β.) $I = \frac{\bar{E}}{R_{\text{os}}} = \frac{120}{25 + 5} = 4 \text{ A}$

Γ.) $V_1 = V_{\text{π}} - V_{\text{βr}} = E - I r - I \cdot R_2 = 120 - 4 \cdot 5 - 4 \cdot 10 = 60 \text{ V}$

$$E_{\text{us}} = \frac{V_1^2}{R_1} \cdot t = \frac{60^2}{60} \cdot 100 = 6000 \text{ J.}$$

Δ.) $B = k_{\mu} 4\pi I_2 \frac{N}{l} = 10^{-7} \cdot 4 \cdot \pi \cdot 3 \cdot \frac{1000}{1} = 12\pi \cdot 10^{-4} \text{ T.}$

$$I_2 = I - I_1 = I - \frac{V_1}{R_1} = 4 - \frac{60}{60} = 3 \text{ A}$$