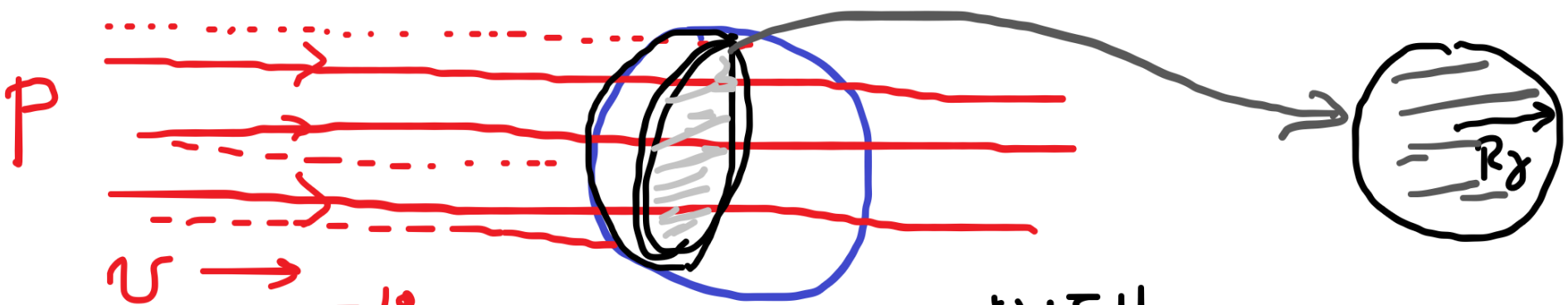
26.10 ΗΛΙΑΚΟΣ ΑΝΕΜΟΣ (SOLARWIND)

22.4.20 (1)



$$A = \pi R_\gamma^2$$

$\upsilon \rightarrow$

$q = 1.6\,10^{-19}\,C$

$\eta = \dfrac{8.7}{cm^3}$

$\upsilon = 470\ km/s$

$R_\gamma = 6.37\,10^6\,m$

(α) $J = ?$ (β) $i = ?$

ΛΥΣΗ

(α) $J = \eta \cdot q \cdot \upsilon = \dfrac{8.7}{(10^{-2}m)^3}\ 1.6\,10^{-19}\,C\ 470\,10^3\ \dfrac{m}{sec}$ → A

$J = 6.54\,10^{-7}\ A/m^2$

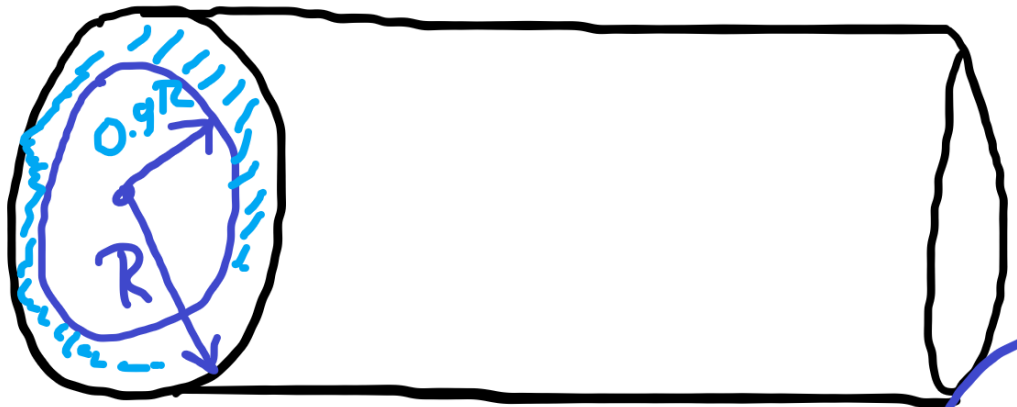
(β) $i = J \cdot A = 6.54\,10^{-7}\ \dfrac{A}{m^2}\ 3.14\ (6.37\,10^6\,m)^2$

$$\boxed{i = 8.34\,10^7\ A}$$

22.4.20 (2)

26.12

$R = 2\,mm$



$$J = \underbrace{3\times10^{8}\,t^{2}}_{\alpha}\ \frac{A}{m^{2}} = \alpha r^{2}$$

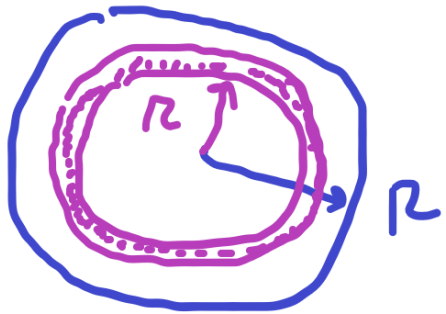
$$\frac{A}{m^{4}}$$

ΛΥΣΗ

$$i = \int_{0.9R}^{R} \vec{J}\cdot d\vec{A} = \int_{0.9R}^{R} J\cdot dA = \int_{0.9R}^{R} \alpha r^{2}\, 2\pi r\, dr = 2\pi\alpha \int_{0.9}^{R} t^{3}\, dr$$

$$i = \frac{2\pi\alpha}{4}\left[R^{4} - (0.9R)^{4}\right]$$

$$\frac{r^{4}}{4}\Big|_{0.9R}^{R}$$



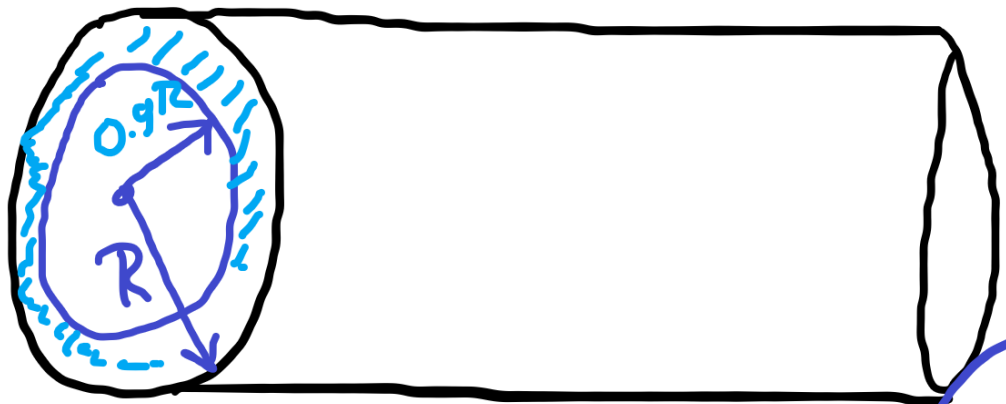
$$dA = 2\pi r\, dr$$

$$i = 2.59\times10^{-3}\ A$$

$$= 2.59\ mA$$

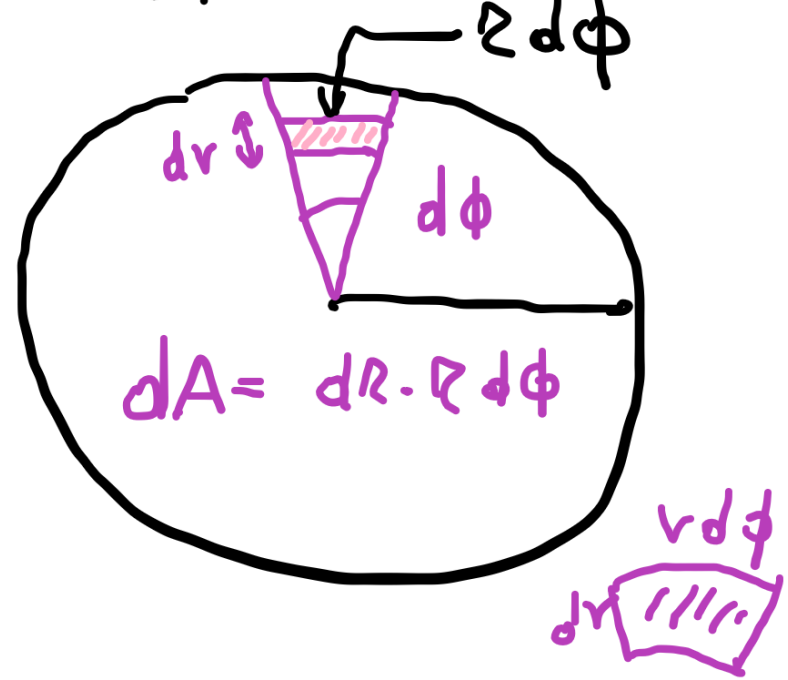
26.12

$R = 2mm$



$$J = \underbrace{3\times10^{8}\,\mathcal{E}^2}_{\alpha}\ \frac{A}{m^2} = \alpha r^2$$

$$\frac{A}{m^4}$$



ΛΥΣΗ

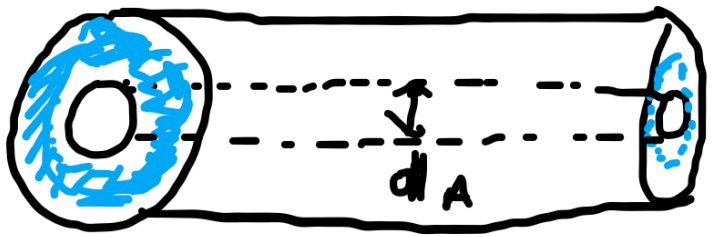
$$i = \int_{0.9R}^{R} \vec{J}\cdot d\vec{A} = \int_{0.9R}^{R} J\cdot dA$$

$$i = \int_{0.9R}^{R}\int_{0}^{2\pi} \alpha r^2 \underbrace{r\,d\phi\,dR}_{dA} = 2\pi\alpha \int_{0.9R}^{R} r^3\,dr \ \ldots\ -$$

22.4.20 ④

26.23

Ⓐ  $d_A = 1\,mm$

Ⓑ 

$d_B = 2\,mm$

$\frac{R_A}{R_B} = ?$

ΛΥΣΗ:

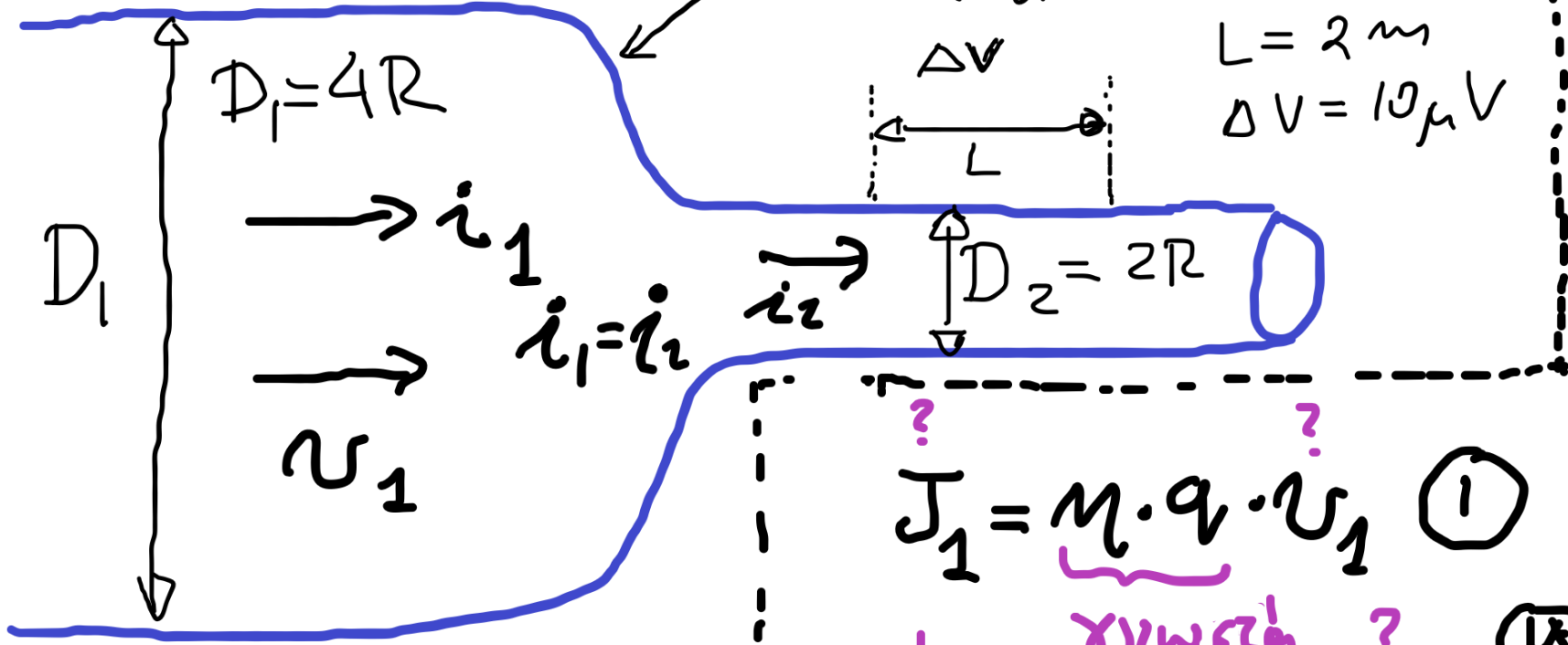
$$R_A = \rho \frac{L}{\pi (d_A/2)^2} = \rho \frac{4L}{\pi d_A^2} \quad (1)$$

$$R_B = \rho \frac{L}{\pi\left[\left(\frac{d_B}{2}\right)^2 - \left(\frac{d_A}{2}\right)^2\right]} = \rho \frac{4L}{\pi (d_B^2 - d_A^2)} \quad (2)$$

$$\frac{(1)}{(2)} = \frac{R_A}{R_B} = \frac{d_B^2 - d_A^2}{d_A^2} = \frac{4-1}{1} = 3$$

26.36

22.4.20 (5)



$n_{Cu} = 8.49\,10^{28}\ m^{-3}$

$q = 1.6\,10^{-19}\ C$

$J_1 = n \cdot q \cdot \upsilon_1$ (1)

γνωστά ? (1A)

$J_1 \cdot A_1 = J_2 A_2$ → χρειαζόμαστε μια σχέση για J2 ⇒

$E_2 = \frac{\Delta V}{L} = \frac{10\ mV}{2m} = 5\,10^{-6}\ \frac{V}{m}$ (3)

→ $E_2 = \rho J_2 \Rightarrow J_2 = \frac{E_2}{\rho}$ (2)

(2)(3) ⇒ $J_2 = \frac{5\,10^{-6}\ V/m}{1.69\,10^{-8}\ \Omega m}$

$J_2 = 296\ A/m^2$ (4)

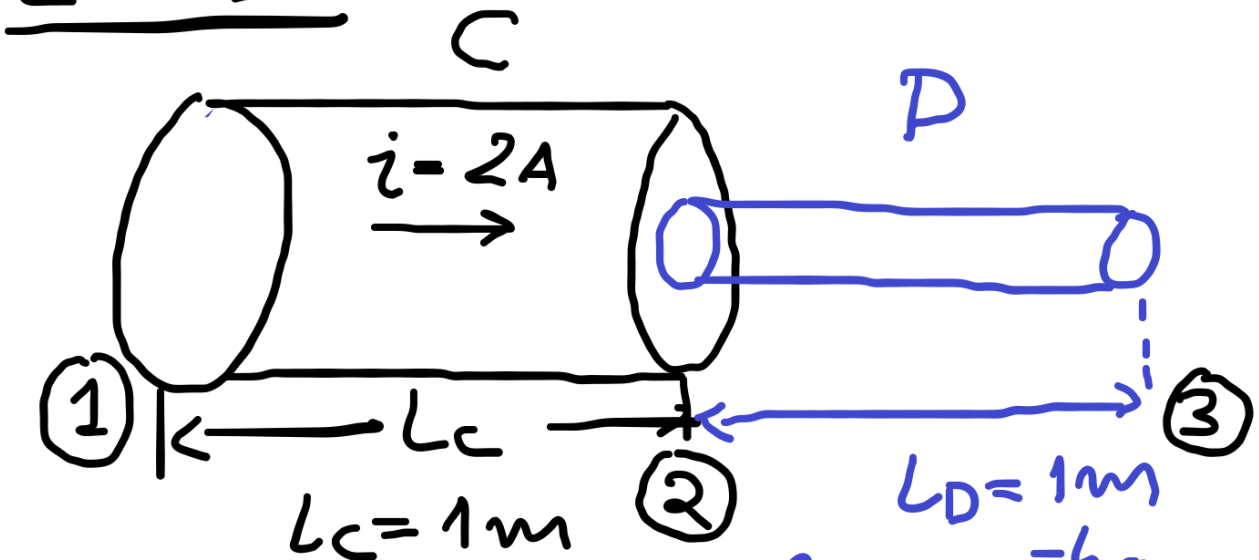
(1A) → $J_1 A_1 = J_2 A_2 \rightarrow J_1/J_2 = A_2/A_1$

→ $J_1 = J_2/4 = 74\ A/m^2$ (5)

(1)(5) ⇒ $\upsilon_1 = 5.44\,10^{-9}\ \frac{m}{s}$

22.4.20 (6)

26.53



(a) $V_{12}=?$ $V_{23}=?$

(b) $P_{12}=?$, $P_{23}=?$

ΔΥ ΣΗ

(a) $V_{12} = R_C \cdot i$ } ⇒

$R_C = \rho_C \frac{L}{A}$

$V_{12} = \rho_C \frac{L}{\pi (d_C/2)^2} \cdot i$

$V_{12} = 5.1$ VOLT

$V_{23} = 10.2$ VOLT

b) $P = R \cdot i^2 \rightarrow P_C = R_C \cdot i^2 = 10.2W$

$\rightarrow P_D = R_D \cdot i^2 = 20.36\ W$

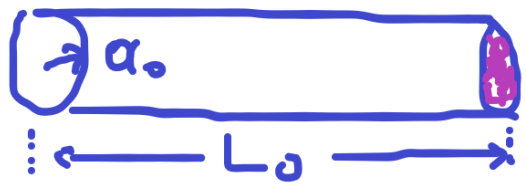
22.4.20 (7)

26-20:

$i = 50\,mA$
$R = 2\,k\Omega$
$V = ?$

$\rightarrow V = 50\,mA \cdot 2\,k\Omega = 50 \cdot 10^{-3}\,A \cdot 2 \cdot 10^{3}\,\Omega = 100\,V$

26-21:

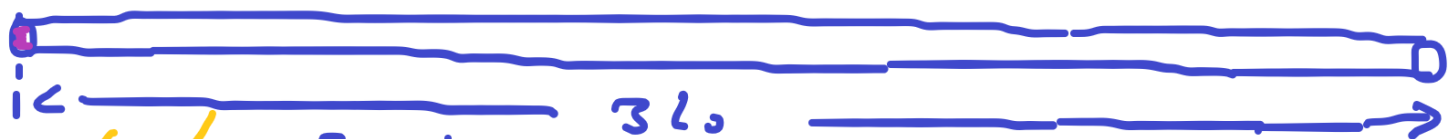


$R_0 = 6.0\,\Omega$

$R_T = ?$

$R = \rho \frac{L}{A}$

πυκνότητα



$M = L_0 \pi a_0^2 d = 3L_0 \pi a_T^2 \cdot d \Rightarrow a_T^2 = a_0^2/3 \rightarrow a_T = a_0/\sqrt{3}$

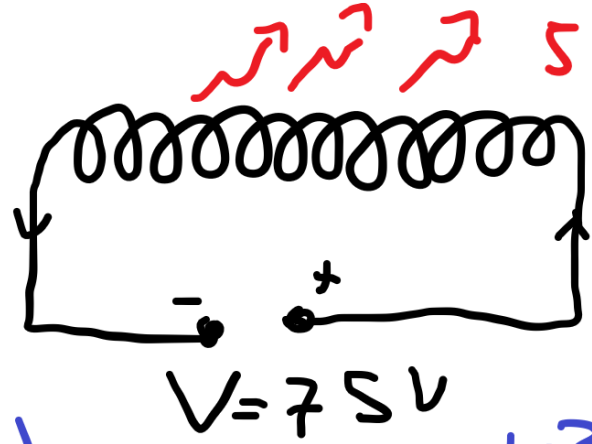
$R_T = \rho \frac{3L_0}{\pi (\frac{a_0}{\sqrt{3}})^2} \Rightarrow R_T = \rho \frac{9L_0}{\pi a_0^2} = 9 \left[\rho \frac{L_0}{\pi a_0^2}\right] = 9 \times 6\,\Omega = 54\,\Omega$

R_0

22.4.20 (8)

26-49

$V = 75\,V$
$A = 2.6\,10^{-6}\,m^2$
$\rho = 5\,10^{-7}\,\Omega m$



(α) $P = 5000\,W$, $L = ?$ (β) $V = 100\,V$, $\rightarrow L = ?$

ΛΥΣΗ:

α) $R = \rho \frac{L}{A}$ ← ?

? ↑ ↑

① $\xrightarrow{③}$ $L = \frac{RA}{\rho} = 5.85\,m$

$P = \frac{V^2}{R} \Rightarrow R = \frac{V^2}{P}$ (2) $\rightarrow R = \frac{(75\,V)^2}{5000\,V \cdot A} = \underline{1.125\,\Omega}$ ③

(β)

$P = V \cdot I \rightarrow 50\,A \Rightarrow$

$R = \frac{100\,V}{50\,A} = 2\,\Omega$

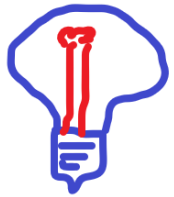
$R = \rho \frac{L}{A} \rightarrow L = \frac{RA}{\rho}$

$\underline{L = 10.4\,m}$

22.4.20

9

26-51



100W

1 Kwh = Η ενέργεια που παράγεται/καταναλώνεται σε μία ώρα από μονάδα με ισχύ 1 Kw

$P = 100\,W$

$V = 100\,V$

$1\,Kwh \rightarrow 6$ cent

$T = 31\,d$

$U = ?$

α) ΛΥΣΗ:

$U = P \cdot T = 100\,W \cdot 31 \cdot 24\,h$

$= 74.4\,Kwh$

$X = 74.4\,Kwh \cdot 0.06\,€$

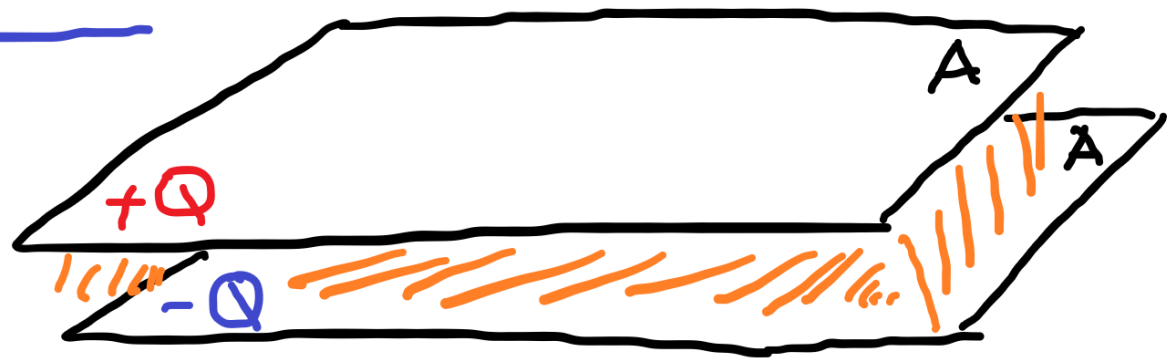
$= 4.46\,€$

β) $I = \frac{P}{V} = \frac{100\,W}{100\,V} = 1\,A$

γ) $R = \frac{V}{I} = \frac{100\,V}{1\,A} = 100\,\Omega$

25-54

22.4.20 (10)

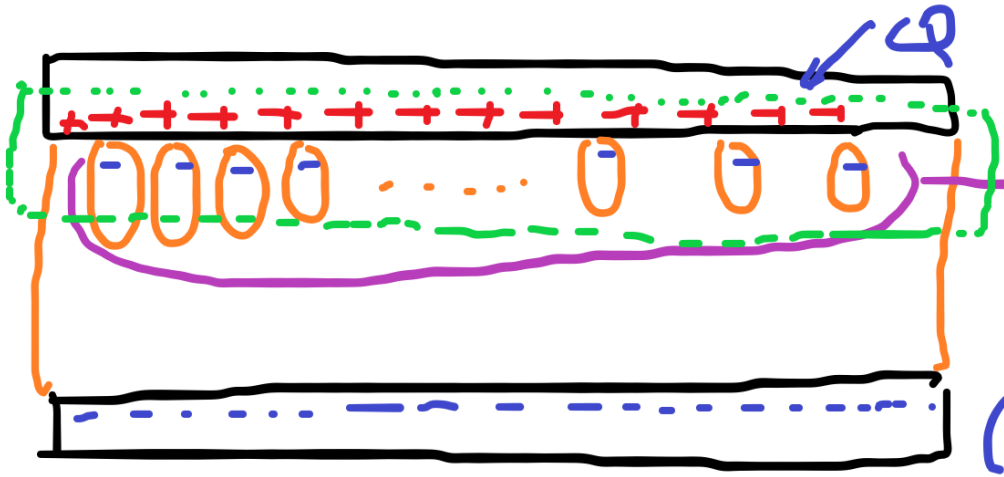


$A = 100\,cm^2$

$Q = 8.9 \times 10^{-7}\,C$

$E = 1.4 \times 10^{6}\,V/m$

(α) $K = ?$ (β) $Q_{επ} = ?$



$$\varepsilon_0 K \oint \vec{E} \cdot d\vec{A} = Q \quad (1)$$

$$\varepsilon_0 \oint_S \vec{E} \cdot d\vec{A} = Q - Q_{επ} \quad (2)$$

ΛΥΣΗ

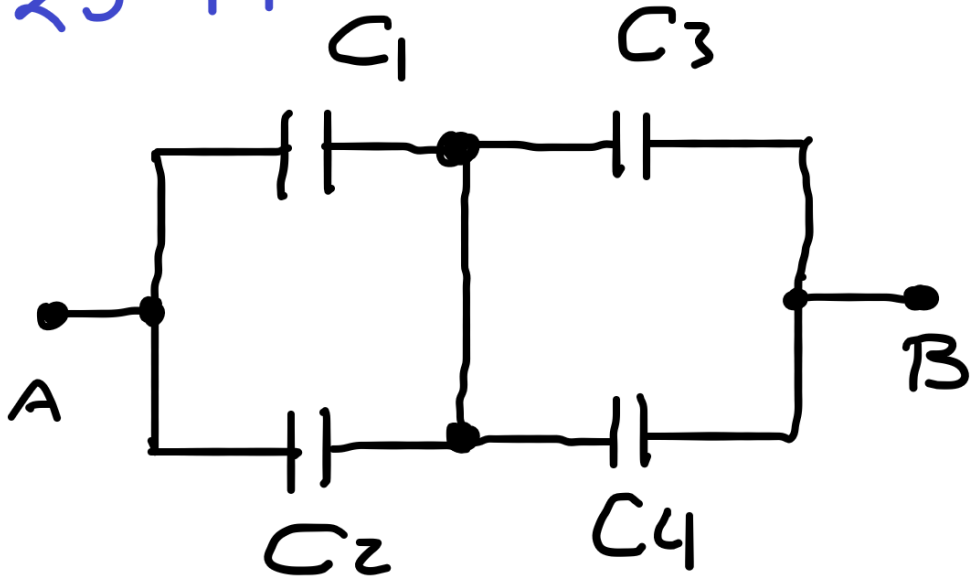
(α) (1) $\rightarrow \varepsilon_0 K E \cdot A = Q \Rightarrow K = \dfrac{Q}{\varepsilon_0 E A} = 7.18$

(β) (2) $\rightarrow \varepsilon_0 E \cdot A = Q - Q_{επ} \Rightarrow Q_{επ} = Q - \varepsilon_0 E A \Rightarrow$

$$Q_{επ} = 7.7\,10^{-7}\,C$$

22.4.18 (11)

25-77



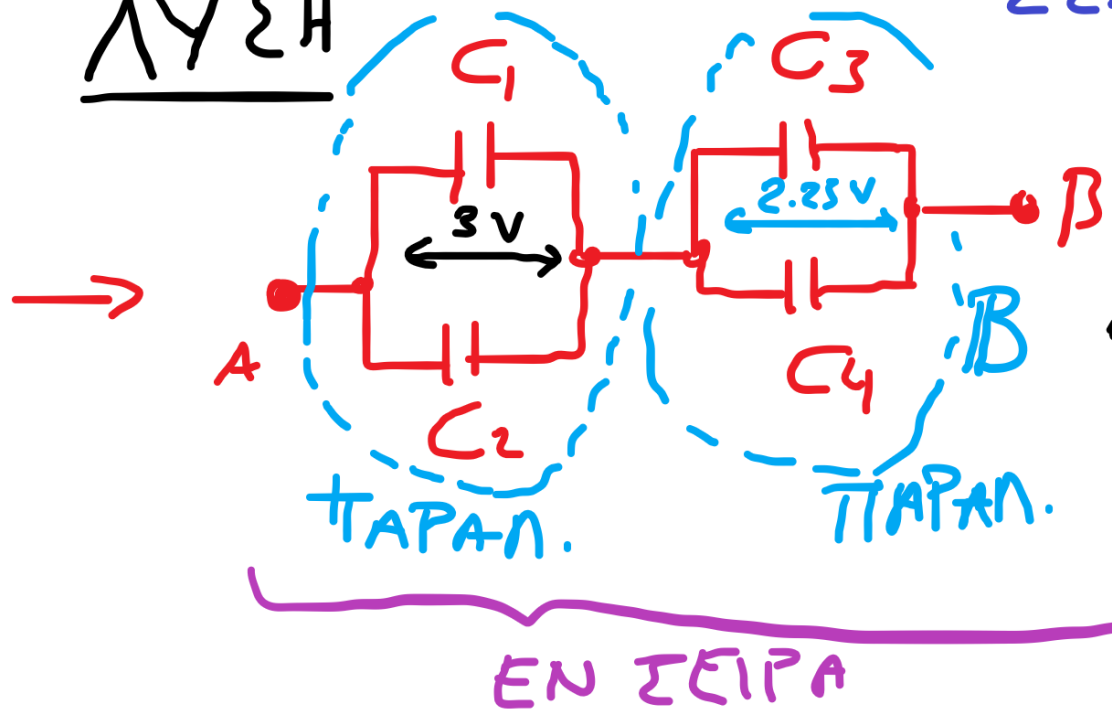
$C_1 = 10\ \mu F$

$C_2 = C_3 = C_4 = 20\ \mu F$

$Q_1 = 30\ \mu C$

$V_A - V_B = ?$

ΛΥΣΗ



$\therefore V_{AB} = 5.25\ V$

$V_1 = \frac{30\ \mu C}{10\ \mu F} = 3\ Volt \rightarrow V_2 = 3\ Volt$

$Q_2 = 3\ Volt\ 20\ \mu F = 60\ \mu C \rightarrow$

$Q_1 + Q_2 = 90\ \mu C$

B: $C_B = C_3 + C_4 = 40\ \mu F$ | $V_B = \frac{90\ \mu C}{40\ \mu F}$

$Q_B = 90\ \mu C$ | $V_B = 2.25\ V$