KOLOKVIJ 2 — 22. jan 2020 VSŠ

1.)

$U = 500\,V$

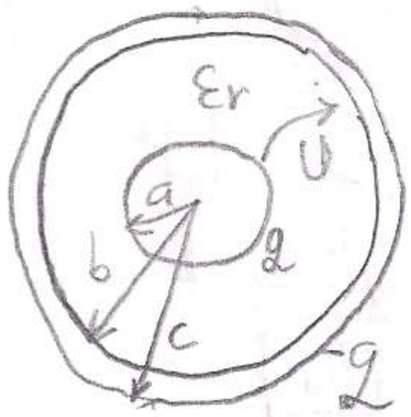
$a = 3\,mm$

$b = 7\,mm$

$c = 9\,mm$

$\varepsilon_r = 6$

$q = ?$ (na plašču)



$$V(r) = \frac{q}{2\pi\varepsilon} \ln\frac{c}{b}$$

$$q = \frac{V \cdot 2\pi\varepsilon_r\varepsilon_0}{\ln\frac{b}{a}} = 196{,}9\ nC/m \cong 197\ nC/m$$

(↑ električna na žički)

električna na plašču $Q = -q = -197\ nC/m$

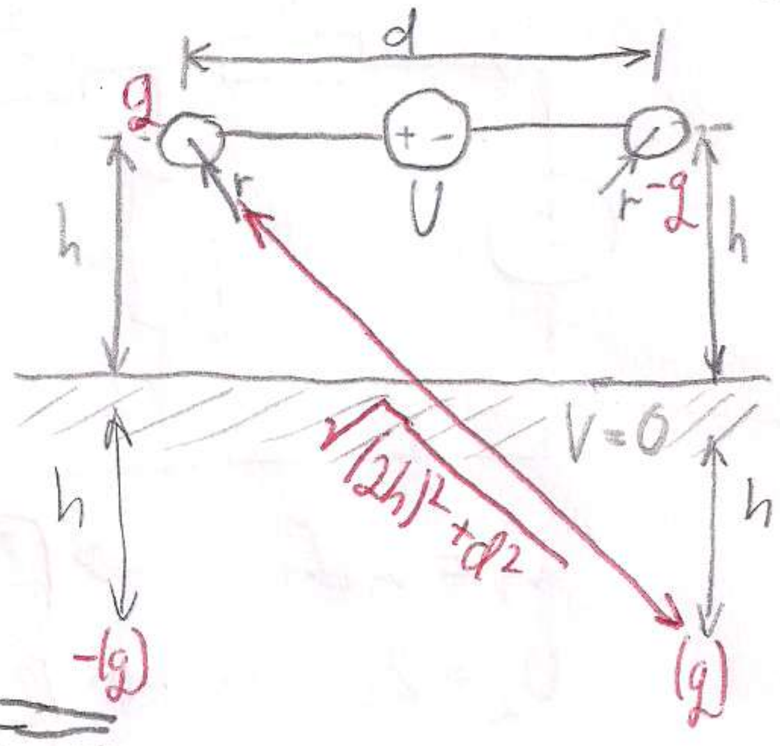
2)

$U = 20\,kV = 20000\,V$

$r = 10\,mm = 0{,}01\,m$

$d = 5\,m$

$h = 1\,m$



$$V_{lev} = \frac{q}{2\pi\varepsilon_0}\ln\frac{d}{r} + \frac{q}{2\pi\varepsilon_0}\ln\frac{2h}{\sqrt{(2h)^2+d^2}}$$

$$= \frac{q}{2\pi\varepsilon_0}\ln\frac{2hd}{r\sqrt{(2h)^2+d^2}}$$

$V_{des} = -V_{lev}$

$U = V_{lev} - V_{des} = V_{lev} - (-V_{lev})$

$= 2V_{lev} \Rightarrow V_{lev} = \frac{U}{2}$

$$V_{lev} = \frac{U}{2} = \frac{q}{2\pi\varepsilon_0}\ln\frac{2hd}{r\sqrt{(2h)^2+d^2}}$$

$$q = \frac{10000\,V \cdot 2\pi\varepsilon_0}{\ln\frac{2hd}{r\sqrt{(2h)^2+d^2}}} = \frac{10000\,V \cdot 2\pi\varepsilon_0}{\ln\frac{2\cdot 1m\cdot 6m}{0{,}01m\sqrt{(2\cdot 1m)^2+6^2}}} = \frac{10000\,V\cdot 2\pi\varepsilon_0}{\ln\frac{12m}{0{,}063m}}$$

$q = 105{,}97\ nC/m \cong 106\,nC$

$$W_e = \frac{1}{2}q(V_{lev} - V_{des}) = \frac{1}{2}q\left(\frac{U}{2} - \left(-\frac{U}{2}\right)\right) = \frac{1}{2}\cdot q\cdot U = \frac{1}{2}\cdot 106\,nC\cdot 20\,kV = 1{,}06\,mJ$$

($V_{des} = -V_{lev}$; $\frac{U}{2}+\frac{U}{2} = U$)

3.)

$\vartheta_1 = -10°C$

$R(\vartheta_1) = 60\,\Omega$

$\vartheta_0 = 20°C$

$\alpha = 0{,}0039\,K^{-1}$

$U = 200\,V$

$\vartheta_2 = 90°C$

$P = ?$

$$R(T) = R(T_0)(1+\alpha\Delta T)$$

$60\,\Omega = R(T_0)\left(1 + 0{,}0039\,K^{-1}(-10-20\,K)\right)$

$$R(T_0) = \frac{60\,\Omega}{(1+0{,}0039\,K^{-1}\cdot(-30K))} = 67{,}95\,\Omega$$

$R(90°C) = R(T_0)(1+\alpha\Delta T)$

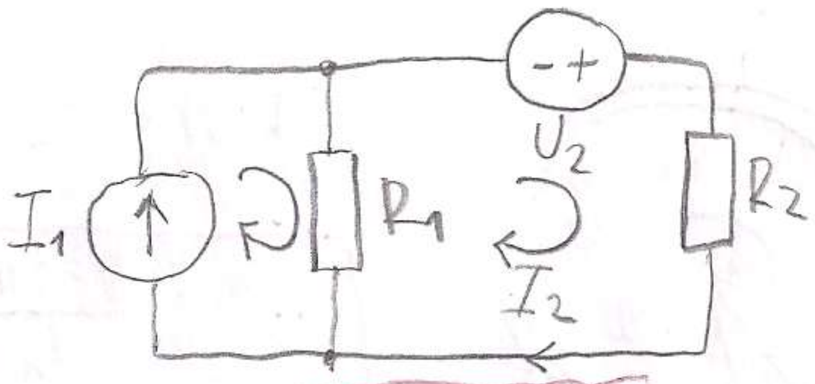
$= 67{,}95\,\Omega\left(1 + 0{,}0039\,K^{-1}(\underbrace{90-20}_{70}K)\right)$

$= 86{,}5\,\Omega$

$$P = \frac{U^2}{R} = \frac{200\,V^2}{86{,}5\,\Omega} = 462{,}43\,W = P$$

Kol 2 VSS 22.1.2020

4) $I_1 = 5A$
$R_1 = 2\Omega$
$R_2 = 8\Omega$
$U_2 = 10V$
$I_2 = ?$



$$R_2 I_2 + R_1 (I_2 - I_1) - U_2 = 0$$

$$R_2 I_2 + R_1 I_2 - R_1 I_1 - U_2 = 0$$

$$R_2 I_2 + R_1 I_2 = U_2 + R_1 I_1$$

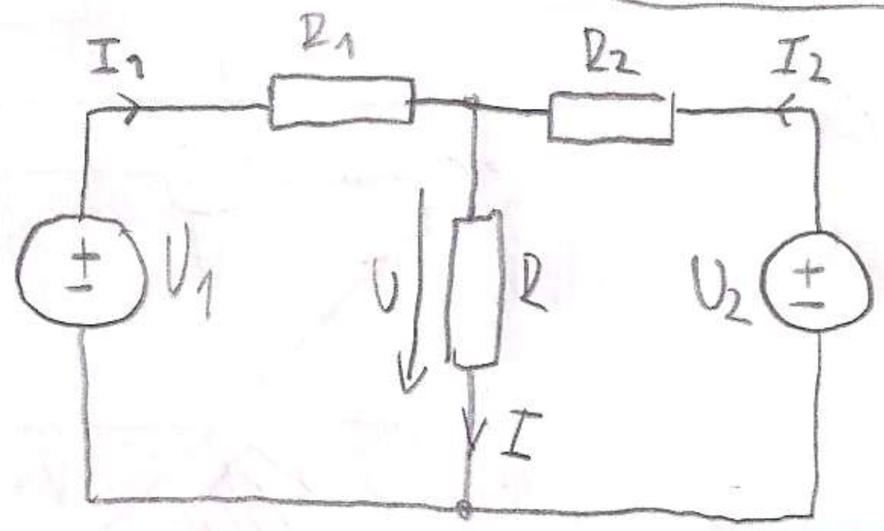
$$I_2 (R_2 + R_1) = U_2 + R_1 I_1$$

$$I_2 = \frac{U_2 + R_1 I_1}{R_2 + R_1}$$

$$= \frac{10V + 2\Omega \cdot 5A}{8\Omega + 2\Omega} = \underline{\underline{2A}}$$

---

5) $U_1 = 8V$
$R_1 = 2\Omega$
$R_2 = 3\Omega$
$U_2 = 12V$
$U = 6V$
$R = ?$



$$U_1 = R_1 I_1 + U \Rightarrow I_1 = \frac{U_1 - U}{R_1} = \frac{8V - 6V}{2\Omega} = 1A$$

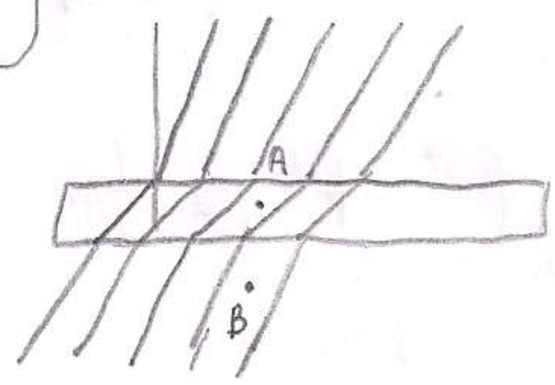
$$U_2 = R_2 I_2 + U \Rightarrow I_2 = \frac{U_2 - U}{R_2} = \frac{12V - 6V}{3\Omega} = 2A$$

$$I = I_1 + I_2 = 1A + 2A = 3A$$

$$R = \frac{U}{I} = \frac{6V}{3A} = \underline{\underline{2\Omega}}$$

Kol 2. VSS, 28.1.2019

1) $\chi_e = 3$
$E = 20 kV/m$
$\alpha = 40°$



a) $$\varepsilon = (1 + \chi_e)\,\varepsilon_0 = (1+3) \cdot 8{,}854 \cdot 10^{-12} \frac{As}{Vm} = 3{,}54 \cdot 10^{-11} \frac{As}{Vm}$$

$$w = \frac{\varepsilon E^2}{2} = \frac{3{,}54 \cdot 10^{-11} \frac{As}{Vm} \cdot (20000 V)^2}{2} = \underline{\underline{7{,}08 \, mJ/m^3}}$$

b) $\alpha_0 = ?$ $$\frac{\tan\alpha_0}{\tan\alpha} = \frac{\varepsilon_0}{\varepsilon}$$

$$\tan\alpha_0 = \frac{\varepsilon_0}{\varepsilon} \tan\alpha = \frac{8{,}854 \cdot 10^{-12} \frac{As}{Vm}}{3{,}54 \cdot 10^{-11} \frac{As}{Vm}} \cdot \tan 40° = 0{,}21$$

$$\alpha = \underline{\underline{11{,}8°}}$$

c) $d_{AB} = 1mm$

$|U_{AB}| =$

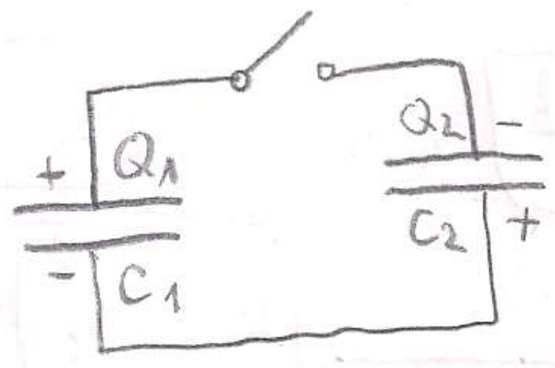
Kol 2. VSS, 28.1.2019

2) $C_1 = 60\,\mu F$

$C_2 = 70\,\mu F$

$\pm Q_1 = \pm 20\,mC$

$\pm Q_2 = \pm 50\,mC$



a) W = ? pred sklenitvijo stikala

$W_1 = \frac{1}{2} C_1 U_1^2 = \frac{1}{2} C_1 \frac{Q_1^2}{C_1^2} = \frac{1}{2} \frac{Q_1^2}{C_1}$

$W_2 = \frac{1}{2} \frac{Q_2^2}{C_2} =$

$W = W_1 + W_2 = \frac{1}{2}\left(\frac{Q_1^2}{C_1} + \frac{Q_2^2}{C_2}\right)$

$= \frac{1}{2}\left[\frac{(20\cdot10^{-3})^2}{60\cdot10^{-6}} + \frac{(50\cdot10^{-3})^2}{170\cdot10^{-6}}\right]$

$= \underline{21{,}2\,J}$

$-Q_1 + Q_2$

$=$

b) $U_1' = U_2'$ $\quad -Q_1' - Q_2' = konst.$

$= -20\,mC + 50\,mC = \underline{30\,mC}$

U_1' (po vklopitvi) $\quad -U_1' + U_2' = 0 \rightarrow U_1' = U_2'$

$-U_1'(C_1 + C_2) = 30\,mC$

$U_1' = -\frac{30\,mC}{C_1 + C_2} = -\frac{30\,mC}{170\cdot10^{-6}\,F} = \underline{-231\,V}$

c) $U_2' = U_1' = -231\,V$

$W_2 = \frac{1}{2} C_2 U_2^2 = \underline{1{,}86\,J}$

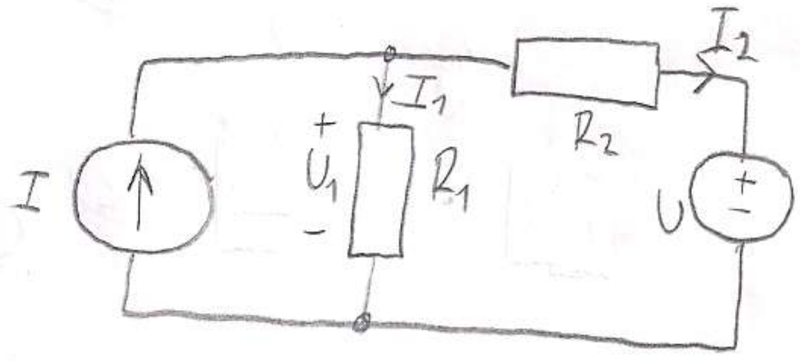
---

3) $R_1 = 30\,\Omega$

$R_2 = 70\,\Omega$

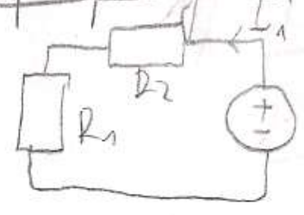
$I = 2A$

$U = 200V$



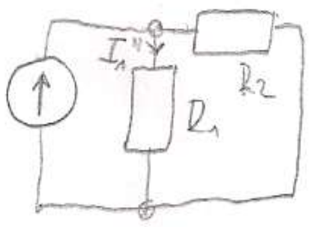
a) Superpozicija

(I.)



$I_1' = \frac{U}{R_1 + R_2} = \frac{200V}{100\,\Omega} = \underline{2A}$

(II.)



$I_1'' = \frac{R_2}{R_1 + R_2} \cdot I = \frac{70\,\Omega}{100\,\Omega} \cdot 2A = \underline{1{,}4A}$

$I_1 = I_1' + I_1'' = \underline{3{,}4A}$

$U_1 = R_1 \cdot I_1 = 30\,\Omega \cdot 3{,}4A = \underline{102\,V}$

b) $I = I_1 + I_2$

$I_2 = I - I_1 = 2A - 3{,}4A = \underline{-1{,}4A}$

c) $P_1 = I_1^2 \cdot R_1 = (3{,}4A)^2 \cdot 30\,\Omega = \underline{346{,}8W}$

$P_2 = I_2^2 \cdot R_2 = (-1{,}4A)^2 \cdot 70\,\Omega = \underline{137{,}2W}$

$P_R = P_1 + P_2 = 346{,}8W + 137{,}2W = \underline{484W}$

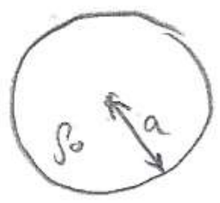
d)

Kol 2 VSŠ, 19.1.2018

1.) $a = 9\,cm$

$\rho_0 = 30\,\mu C/m^3$

Kroglin oblak



a) $V = \frac{4\pi R^3}{3} = 0{,}0031\,m^3$ $\quad Q_0 = \rho_0 \cdot V = 30 \cdot 10^{-6}\frac{C}{m^3} \cdot 0{,}0031\,m^3 = \underline{91{,}6\,nC}$

b) $E(a/2)$ $\quad \frac{a}{2} = 4{,}5\,cm = r$

$E = \frac{\rho r}{3\varepsilon_0} = \frac{30 \cdot 10^{-6}\,C/m^3 \cdot 0{,}045\,m}{3 \cdot 8{,}854 \cdot 10^{-12}\frac{As}{Vm}} = \underline{50{,}8\,kV/m}$

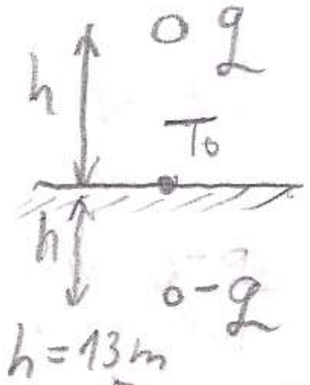
c) $V = \frac{\rho}{2\varepsilon_0}\left(a^2 - \frac{R}{3}\right) = \frac{30\,\mu C/m^3}{2 \cdot 8{,}854 \cdot 10^{-12}\frac{As}{Vm}}\left((0{,}09\,m)^2 - \frac{(0{,}045\,m)^2}{3}\right)$

$R = \frac{a}{2}$

$= 12{,}57\,kV$

$\approx \underline{12{,}6\,kV}$

2.)



$h = 13\,m$

$r = 7\,mm = 0{,}007\,m$

$V = 10\,kV$

a) $V = \frac{q}{2\pi\varepsilon}\ln\frac{h}{r} \rightarrow q = \frac{V \cdot 2\pi\varepsilon}{\ln\frac{2h}{r}} = \frac{10\,kV \cdot 2\pi \cdot 8{,}854\frac{As}{Vm}}{\ln\frac{26\,m}{0{,}007\,m}}$

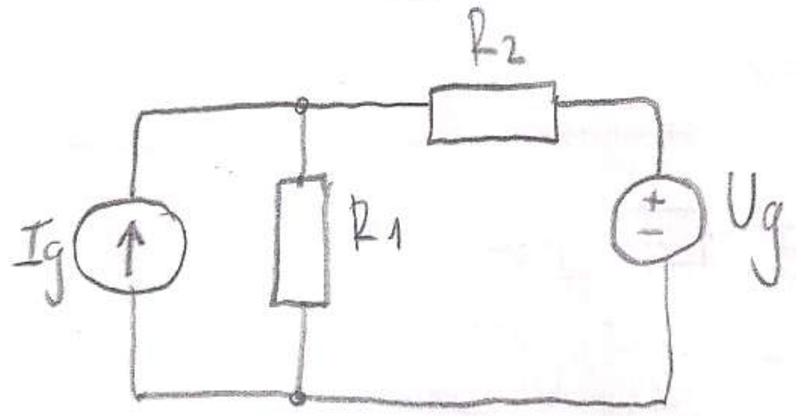
$q = \underline{67{,}7\,nC/m}$

b) $\sigma(T_0) = -\frac{q}{\pi}\frac{h}{h^2} = -\frac{67{,}7\,nC/m}{\pi} \cdot \frac{13\,m}{(13\,m)^2} = -1{,}657\frac{nC}{m^2}$

$= \underline{-1{,}66\frac{nC}{m^2}}$

c) $c = \frac{2\pi\varepsilon_0}{\ln\frac{2h}{a}} = \frac{2\pi \cdot 8{,}854 \cdot 10^{-12}\frac{As}{Vm}}{\ln\frac{26\,m}{0{,}007\,m}} = \underline{6{,}77\,pF/m}$

3.)



$U_g = 12\,V$

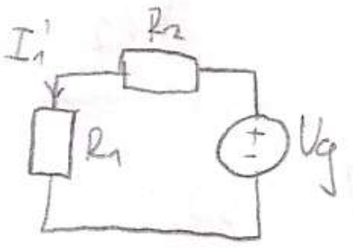
$I_g = 6\,A$

$R_1 = 40\,\Omega$

$R_2 = 8\,\Omega$

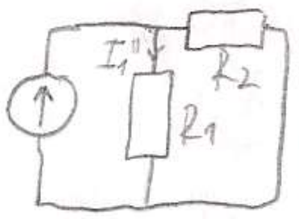
Superpozicija

a) I



$I_1' = \frac{U_g}{R_1 + R_2} = \frac{12\,V}{48\,\Omega} = \underline{0{,}25\,A}$

II



$I_1'' = \frac{R_2}{R_1 + R_2} \cdot I = \frac{8\,\Omega}{48\,\Omega} \cdot 6\,A = \underline{1\,A}$

$I_1 = I_1' + I_1'' = 0{,}25\,A + 1\,A = \underline{1{,}25\,A}$

b) $P_1 = I_1^2 \cdot R_1 = (1{,}25\,A)^2 \cdot 40\,\Omega = \underline{62{,}5\,W}$

c) $U_{R1} = U_{Ig} = R_1 \cdot I_1 = 40\,\Omega \cdot 1{,}25\,\Omega = 50\,V$

$P_{Ig} = U_{Ig} \cdot I_g = 50\,V \cdot 6\,A = \underline{300\,W}$

d) $l = 7\,mm = 0{,}007\,m$

$S = 3\,mm^2 = 3 \cdot 10^{-6}\,m^2$

$R = \frac{1}{\gamma} \cdot \frac{l}{S}$

$\gamma = \frac{l}{R \cdot S} = \frac{0{,}007\,m}{8\,\Omega \cdot 3 \cdot 10^{-6}\,m^2} = 291{,}66\,S/m$

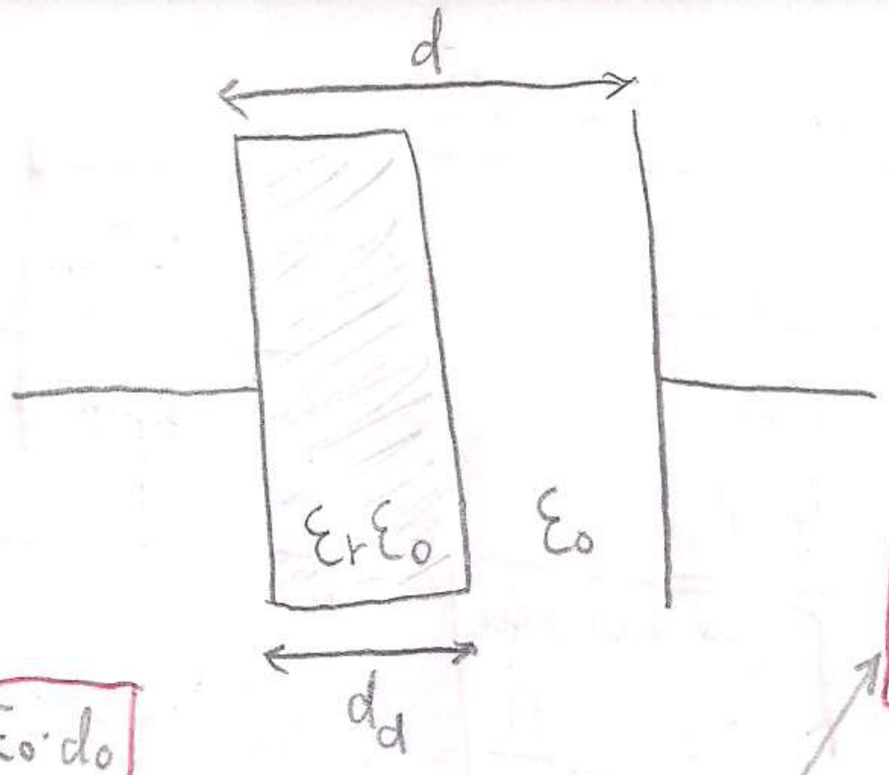
$\approx \underline{292\,S/m}$

Kol 2. VSŠ, 31.1.2011

1) $U = 14\,kV$

$\varepsilon_r = 6$, $d_0 = d - d_d = 9{,}7\,mm$

$d_d = 2{,}3\,mm$, $d = 12\,mm$



a) $U = U_d + U_0 = E_d \cdot d_d + E_0 \cdot d_0$

$D_d = D_0$

$= E_d \cdot d_d + \varepsilon_r \cdot E_d \cdot d_0 = E_d(d_d + \varepsilon_r d_0)$

$\varepsilon_0 \varepsilon_r E_d = \varepsilon_0 E_0$

$E_0 = \varepsilon_r \cdot E_d$

$E_d = \frac{U}{d_d + \varepsilon_r \cdot d_0}$

$= \frac{14000\,V}{2{,}3\,mm + 6 \cdot 9{,}7\,mm}$

$= \underline{231{,}4\,kV/m}$

b) $E_2 = 2{,}1\,kV/mm$

$d' = ?$

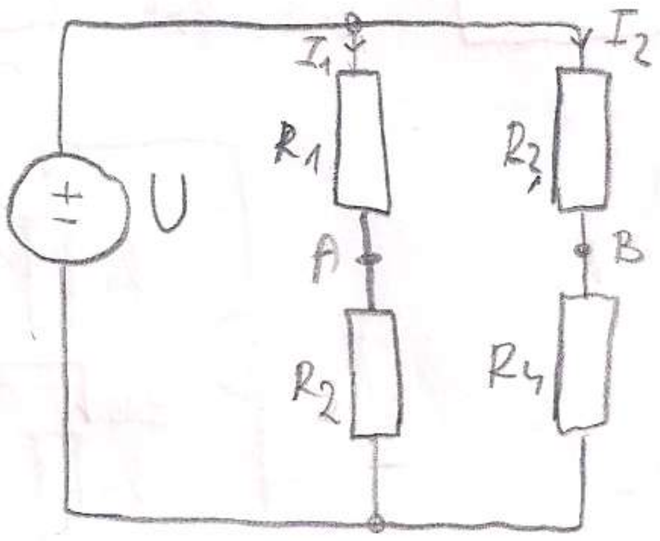
WHEATSONOV MOSTIČ

2) $R_1 = 1{,}5\,\Omega$ $U_0 = 12{,}5\,V$

$R_2 = 40\,\Omega$

$R_3 = 50\,\Omega$

$R_4 = 32\,\Omega$



a) $I_1 = \frac{U}{R_1 + R_2}$

$I_2 = \frac{U}{R_3 + R_4}$

$\frac{I_1}{I_2} = \frac{\frac{U}{R_1+R_2}}{\frac{U}{R_3+R_4}} = \frac{R_3+R_4}{R_1+R_2} = \frac{82\,\Omega}{44{,}5\,\Omega} = \underline{1{,}843}$

b) $U_{AB} = U_A - U_B = U_0 \frac{R_2}{R_1+R_2} - U_0 \frac{R_4}{R_3+R_4} = U_0\left(\frac{R_2}{R_1+R_2} - \frac{R_4}{R_3+R_4}\right)$

$= 12{,}5\,V\left(\frac{40\,\Omega}{44{,}5\,\Omega} - \frac{32\,\Omega}{82\,\Omega}\right) \approx \underline{6{,}36\,V}$

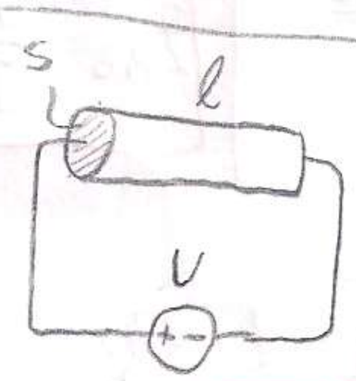
3) $S = 1{,}5\,mm^2$

$l = 21\,mm$

$U = 5\,V$

$\gamma_{20} = 8\,\frac{S}{m}\,(20°C)$

$\alpha = 2{,}9 \cdot 10^{-3}\,K^{-1}$



a) $R = \frac{1}{\gamma}\frac{l}{A} = \frac{1}{8\,\frac{S}{m}}\,\frac{0{,}021\,m}{1{,}5 \cdot 10^{-6}\,m^2} = 1750\,\Omega$

$I_{20} = \frac{U}{R} = \frac{5\,V}{1750\,\Omega} \approx \underline{2{,}86\,mA}$

b) $\frac{1}{\gamma_{20}} = \rho_{20} = 0{,}125\,\Omega m$

$\rho(60°) = 0{,}125\,(1 + \alpha(60° - 20°))$

$= 0{,}125\,(1 + 0{,}0029 \cdot 40°)$

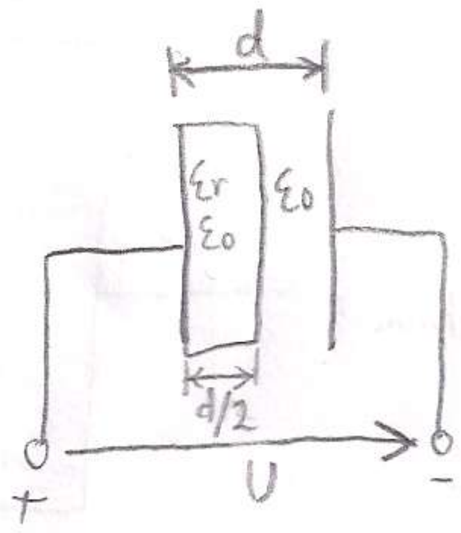
$= \underline{0{,}1395\,\Omega m}$

$\gamma_{60} = \frac{1}{\rho_{60}} = \frac{1}{0{,}1395}$

$\gamma_{60} \approx \underline{7{,}17\,\frac{S}{m}}$

Kol 2. VSŠ 3.2.2010

1.) $A = 20\,cm^2$
$d = 1\,mm$
$U = 40V$



a) brez dielektrika ↑
$$C = \varepsilon_0 \frac{A}{d} = 8{,}854 \cdot 10^{-12} \frac{As}{Vm} \cdot \frac{20 \cdot 10^{-4} m^2}{0{,}001\,m} = \underline{17{,}7\,pF}$$

b) $\varepsilon_r = 7{,}83$
$d_d = \frac{d}{2} = 0{,}5\,mm$

$$U = E_1 d_d + E_2 d_1 = \frac{\sigma_L}{\varepsilon_r \varepsilon_0} d_d + \frac{\sigma_L}{\varepsilon_0} d_1 = \frac{\sigma_L}{\varepsilon_0}\left(\frac{1}{\varepsilon_r} d_d + d_1\right)$$

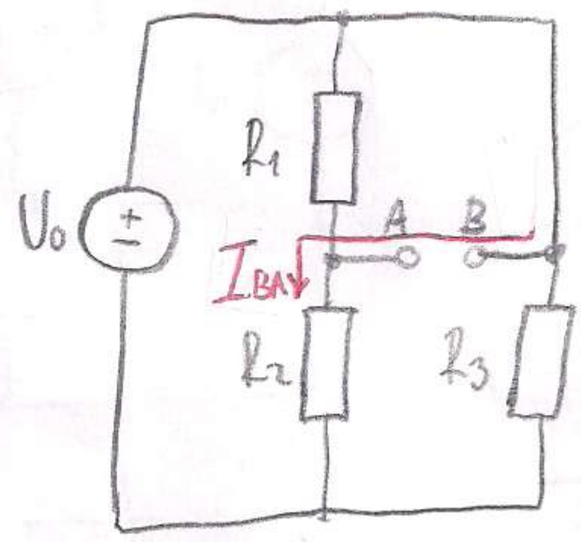
$$\sigma_L = \frac{U \cdot \varepsilon_0}{\frac{1}{\varepsilon_r} d_d + d_1} = \frac{40V \cdot 8{,}854 \cdot 10^{-12} \frac{As}{Vm}}{\frac{1}{7{,}83}\,0{,}0005m + 0{,}0005m} = \underline{628\,\frac{nC}{m^2}}$$

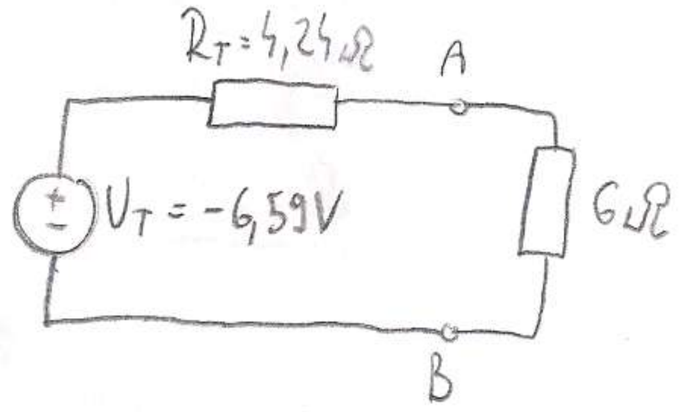
c) $E_d = \frac{\sigma_L}{\varepsilon_0 \varepsilon_r}$

$$w = \frac{\varepsilon E^2}{2} = \frac{\varepsilon_0 \cdot \varepsilon_r \sigma_L^2}{2 \cdot \varepsilon_0^2 \varepsilon_r^2}$$

$$w = \frac{\sigma_L^2}{2 \varepsilon_0 \varepsilon_r} = \frac{628 \cdot 10^{-9} \frac{C}{m^2}}{2 \cdot 8{,}854 \cdot 10^{-12} \frac{As}{Vm} \cdot 7{,}83} = \underline{2{,}84\,mJ/m^3}$$

2.) $U_0 = 14V$
$R_1 = 8\,\Omega$
$R_2 = 9\,\Omega$
$R_3 = 10\,\Omega$





a) $$U_{AB} = V_A - V_B = U_0 \frac{R_2}{R_1 + R_2} - U_0 \frac{R_3}{R_3} = 14V \frac{9\,\Omega}{17\,\Omega} - 14V = \underline{-6{,}59V}$$

b) $$R_N = \frac{R_1 \cdot R_2}{R_1 + R_2} = \frac{8\,\Omega \cdot 9\,\Omega}{8\,\Omega + 9\,\Omega} = 4{,}24\,\Omega$$

$$I_{AB} = \frac{U_{AB}}{R_N} = \frac{-6{,}59V}{4{,}23\,\Omega} = \underline{-1{,}56A}$$

2. način

$$I_{AB} = -\frac{U}{R_2} = -\frac{14V}{9\,\Omega} = \underline{-1{,}56A}$$

$$R_{AB} = \frac{U_{AB}}{I_{AB}} = \frac{-6{,}59V}{-1{,}56A} = \underline{4{,}24\,\Omega}$$

c) $$R_{AB} = R_N = \underline{4{,}24\,\Omega}$$

d) $$P = 6\,\Omega \cdot I^2 = 6\,\Omega \cdot \frac{(-6{,}59V)^2}{(10{,}24\,\Omega)^2} = \underline{2{,}48\,W}$$

↑
$R_T + 6\,\Omega = 4{,}24\,\Omega + 6\,\Omega = 10{,}24\,\Omega$

Kol 2. VSS 3.2.2010

3.) $R(20°) = 8\,\Omega$

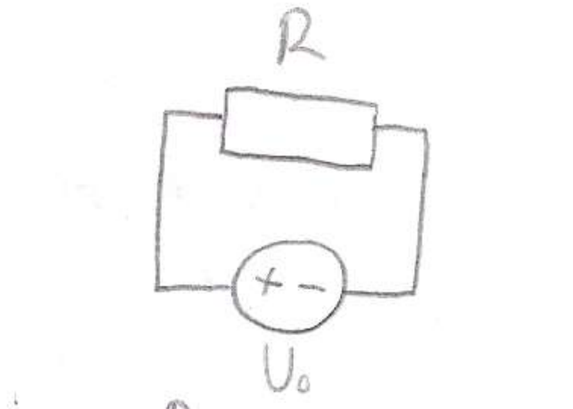
$R(90°) = 14\,\Omega$

a) $\alpha = ?$ $\quad R(T) = R(20°)\,(1+\alpha(T-20°))$

$\frac{R(90°)}{R(20°)} = 1 + \alpha(90°-20°)$

$\frac{14\,\Omega}{8\,\Omega} - 1 = \alpha \cdot 70°$

$\alpha = \frac{\frac{14\,\Omega}{8\,\Omega} - 1}{70°} = 10{,}7 \cdot 10^{-3} K^{-1}$



b) $U_0 = 20V$

$T = 190°C$

$R(190°) = R(20°)\,(1+\alpha(T-20°))$

$= 8\,\Omega\,(1 + 10{,}7 \cdot 10^{-3} K^{-1} \cdot (190°-20°))$

$= 8\,\Omega\,(1 + 10{,}7 \cdot 10^{-3} K^{-1} \cdot 170°)$

$R(190°) = 22{,}55\,\Omega$

$P = \frac{U^2}{R} = \frac{(20V)^2}{22{,}55\,\Omega} = 17{,}7\,W$

c) $R_{NTK}(20°) = 30\,\Omega$

$\Delta R + \Delta R_{NTK} = 0 \rightarrow \alpha \cdot \Delta T \cdot R_0 + \alpha_{NTK} \cdot \Delta T \cdot R_{NTK} = 0 \,/ : \Delta T$

$\Delta R = \alpha \cdot \Delta T \cdot R_0$

$\alpha \cdot R_0 + \alpha_{NTK} \cdot R_{NTK} = 0$

$\alpha_{NTK} = -\alpha \frac{R_0}{R_{NTK}} =$

$= -10{,}7 \cdot 10^{-3} K^{-1} \cdot \frac{8\,\Omega}{30\,\Omega} = -2{,}85 \cdot 10^{-3} K^{-1}$

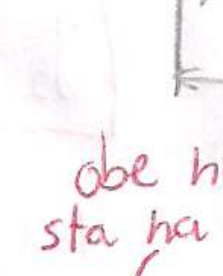
VSS Kol 2. 26.1.2009

1.) $\rho_0 = 0{,}5cm$

$h = 5m$

$q = 0{,}5\,\mu C/m$

$\frac{F_e}{m} = ?$



$E = \frac{q}{2\pi\varepsilon_0(2h)} = \frac{0{,}5 \cdot 10^{-6}\,C/m}{2\pi \cdot 8{,}854 \cdot 10^{-12}\,\frac{As}{Vm} \cdot 10m} = 898{,}77\,V/m$

$\frac{F_e}{m} = \frac{q^2}{4\pi\varepsilon_0 h} = q \cdot E = 0{,}5 \cdot 10^{-6}\,\frac{C}{m} \cdot 898{,}77\,\frac{V}{m} = 0{,}449\,mN/m$

$\approx 0{,}45\,mN/m$

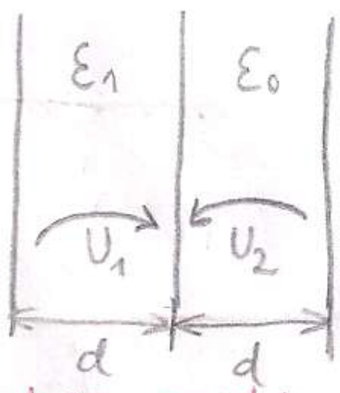
2.) $S = 0{,}5m^2$

$d = 1mm = 0{,}001m$

$\varepsilon_1 = 5 \cdot \varepsilon_0$

$U_1 = 100V$

$U_2 = 50V$



Levi kondenzator

$Q_1 = D_1 S = \varepsilon_1 E_1 S = \frac{\varepsilon_1 U_1 S}{d}$

Desni kondenzator:

$Q_2 = D_2 S = \varepsilon_0 E_2 S = \frac{\varepsilon_0 U_2 S}{d}$

obe neg. sponki sta na srednji plošči

$Q = -Q_1 - Q_2 = -\frac{\varepsilon_1 U_1 S}{d} - \frac{\varepsilon_0 U_2 S}{d} =$

$= -\frac{S}{d}(\varepsilon_1 U_1 + \varepsilon_0 U_2) = -\frac{0{,}5m^2}{0{,}001m}(5 \cdot \varepsilon_0 \cdot 100V + \varepsilon_0 \cdot 50V)$

$= -2{,}43\,\mu C$

Kol 2. VSŠ 26.1.2009

3.) ŽICA
$a = 1\,mm \Rightarrow S = \pi a^2 = \pi \cdot 1\,mm^2 = 3{,}14\,mm^2 = 0{,}00000314\,m^2$
$l = 6\,m$
$\vartheta_0 = 20°C$
$\gamma(20°) = 56{,}5\,MS/m$
$\alpha = 0{,}0039\,K^{-1}$
$U = 0{,}1\,V$
$I = 2\,A$

$R_0 = \frac{1}{\gamma}\frac{l}{S} = \frac{1}{56{,}5\cdot 10^6\,S/m}\,\frac{6\,m}{3{,}14\cdot 10^{-6}\,m^2} = 33{,}8\,m\Omega$

$R = \frac{U}{I} = \frac{0{,}1\,V}{2\,A} = 50\,m\Omega$

$R = R_0(1+\alpha(\vartheta - 20°))$

$\frac{R}{R_0} - 1 = \alpha(\vartheta - 20°)$

$\frac{\frac{R}{R_0} - 1}{\alpha} + 20° = \vartheta$

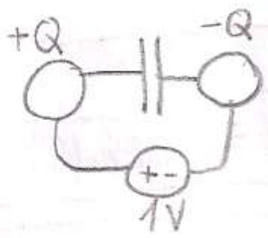
$\vartheta = \frac{\frac{0{,}05\,\Omega}{0{,}0338\,\Omega} - 1}{0{,}0039\,K^{-1}} + 20° \cong 143°C$

4.) Kovinska palica
$l = 1\,m$
$d = 2\,cm = 0{,}02\,m$
$Q = 100\,nC = 100\cdot 10^{-9}\,C$
$E = ?$

$E = 0\,V/m$

Znotraj prevodnika je poljska jakost 0.

5) $U = 1\,V$
$\pm Q = \pm 2\,nC = \pm 2\cdot 10^{-9}\,C$
$C = ?$

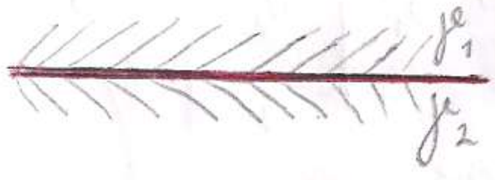


$C = \frac{Q}{U} = \frac{2\cdot 10^{-9}\,C}{1\,V} = 2\,nF$

6.) $\varepsilon_r = 5$
$E = 100\,kV/m$
$w_e = ?$

$w_e = \frac{\varepsilon \cdot E^2}{2} = \frac{\varepsilon_r \cdot \varepsilon_0 \cdot E^2}{2} = \frac{5\cdot 8{,}854\cdot 10^{-12}\,\frac{As}{Vm}\cdot\left(100000\,\frac{V}{m}\right)^2}{2} = 221\,\frac{mJ}{m^3}$

7.) $\gamma_1 = 10\,\frac{MS}{m} = 10\cdot 10^6\,\frac{S}{m}$
$\gamma_2 = 40\,\frac{MS}{m} = 40\cdot 10^6\,\frac{S}{m}$
$J_1 = 40\,\frac{A}{m^2}$
$J_2 = ?$



$J_2 = J_1 = 40\,\frac{A}{m^2}$

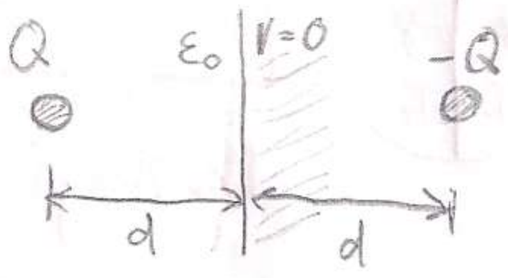
Na meji dveh snovi je normalna komponenta tokovne gostote zvezna.

Kol 2. VSS 14.1.2008

1.) $Q = 0{,}1\,nC = 0{,}1 \cdot 10^{-9}\,C$

$d = 1{,}5\,cm = 0{,}015\,m$

$F_e = ?$



$$E = \frac{Q}{4\pi\varepsilon_0 (2d)^2} = \frac{0{,}1 \cdot 10^{-9}\,C}{4\pi\varepsilon_0 (2 \cdot 0{,}015\,m)^2} = 998{,}6\,V/m$$

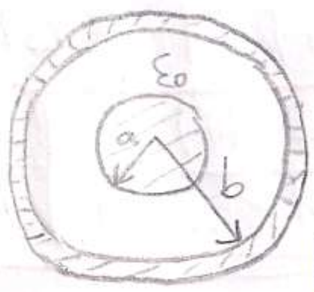
$$F_e = Q \cdot E = 0{,}1 \cdot 10^{-9}\,C \cdot 998{,}6\,V/m = 0{,}099\,\mu N = 0{,}1\,\mu N$$

2.) $E_{pr} = 2{,}5\,MV/m = 2{,}5 \cdot 10^6\,\frac{V}{m}$

$a = 1\,mm = 0{,}001\,m$

$b = 5\,mm = 0{,}005\,m$

$U = ?$, da največja poljska jakost ne preseže 10 % prebojne trdnosti izolacije



$$E_{max} = \frac{|q|}{2\pi\varepsilon a}$$

$$q = c \cdot U = \frac{2\pi\varepsilon}{\ln\left(\frac{b}{a}\right)} \cdot U$$

$$E_{max} = \frac{|U|}{a \cdot \ln\left(\frac{b}{a}\right)}$$

$$E_{max} = \frac{E_{pr}}{10}$$

$$\frac{|U|}{a \cdot \ln\left(\frac{b}{a}\right)} = \frac{E_{pr}}{10} \Rightarrow |U| = \frac{E_{pr}}{10} \cdot a \cdot \ln\left(\frac{b}{a}\right)$$

$$= \frac{2{,}5 \cdot 10^6\,\frac{V}{m}}{10} \cdot 0{,}001\,m \cdot \ln\left(\frac{0{,}005}{0{,}001}\right)$$

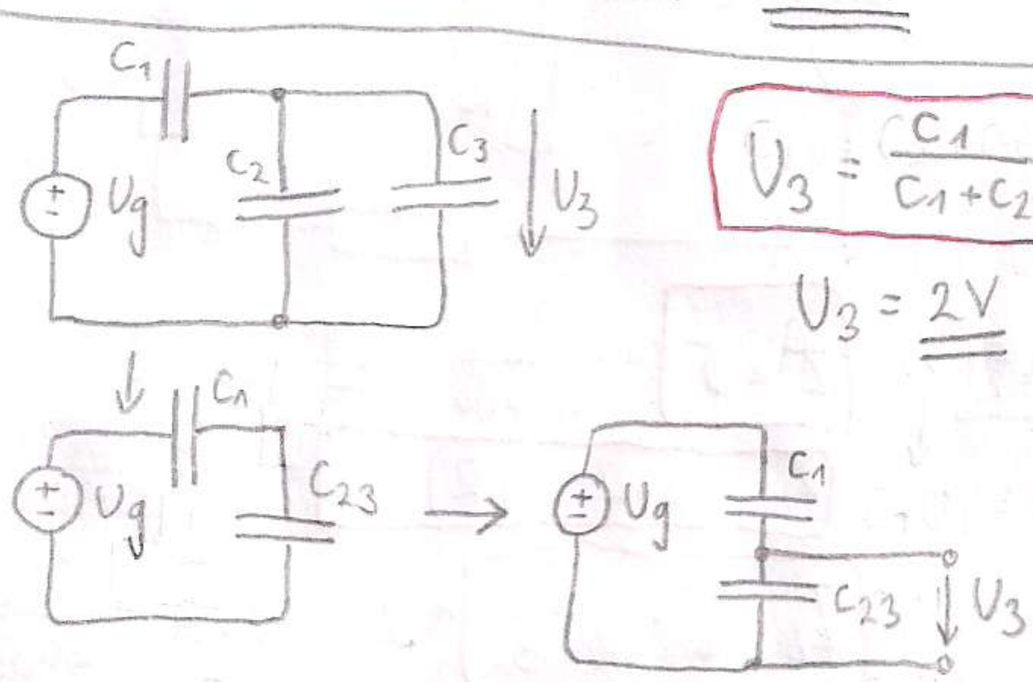
$$|U| \cong 402\,V$$

3.) $U_g = 10\,V$

$C_1 = C_3 = 1\,nF = 10^{-9}\,F$

$C_2 = 3\,nF = 3 \cdot 10^{-9}\,F$

$U_3 = ?$



$$U_3 = \frac{C_1}{C_1 + C_{23}} \cdot U_g = \frac{1\,nF}{1\,nF + 4\,nF} \cdot 10\,V$$

$$U_3 = 2\,V$$

4.) Prevodno telo je nadelektreno z negativno elektrino. Kakšno smer ima vektor el. poljske jakosti v zraku tik nad površino telesa?

5.) $E(T) = (60, 10, 30)\,kV/m$

$\varepsilon = 10^{-10}\,\frac{As}{Vm}$

$w_e(T) = ?$

$$w_x = \frac{1}{2}\varepsilon E_x^2 = \frac{1}{2} \cdot 10^{-10}\,\frac{As}{Vm} \cdot \left(60000\,\frac{V}{m}\right)^2 = 0{,}18\,J/m^3$$

$$w_y = \frac{1}{2}\varepsilon E_y^2 = \frac{1}{2} \cdot 10^{-10}\,\frac{As}{Vm} \cdot \left(10000\,\frac{V}{m}\right)^2 = 0{,}005\,J/m^3$$

$$w_z = \frac{1}{2}\varepsilon E_z^2 = \frac{1}{2} \cdot 10^{-10}\,\frac{As}{Vm} \cdot \left(30000\,\frac{V}{m}\right)^2 = 0{,}045\,J/m^3$$

$$w_e = w_x + w_y + w_z = 0{,}18\,J/m^3 + 0{,}005\,J/m^3 + 0{,}045\,J/m^3$$

$$= 0{,}23\,J/m^3$$

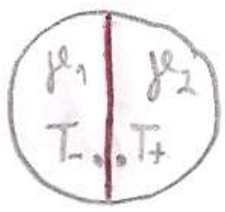
Kol 2 VSS 14.1.2008

6) $\gamma_1 = 10 \frac{MS}{m} = 10 \cdot 10^6 \frac{S}{m}$

$\gamma_2 = 50 \frac{MS}{m} = 50 \cdot 10^6 \frac{S}{m}$

$E(T_-) = 0{,}1\ V/m$

$E(T_+) = ?$



$E(T_+) = E(T_-) = 0{,}1\ V/m$

Na meji dveh snovi je tangencialna komponenta el. poljske jakosti zvezna.

---

7) $\alpha = 10^{-4} K^{-1}$

$R(10°) = 1\,k\Omega$

$R(-10°) = ?$

$R(10°) = R_0(1 + \alpha \Delta T)$

$\Delta T = T - 20° = 10° - 20° = -10°$

$R_0 = \frac{R(10°)}{1 + \alpha \Delta T} = \frac{1000\,\Omega}{1 + 10^{-4} K^{-1} \cdot (-10°C)} = 1001\,\Omega$

$R(-10°) = R_0(1 + \alpha(-10° - 20°))$

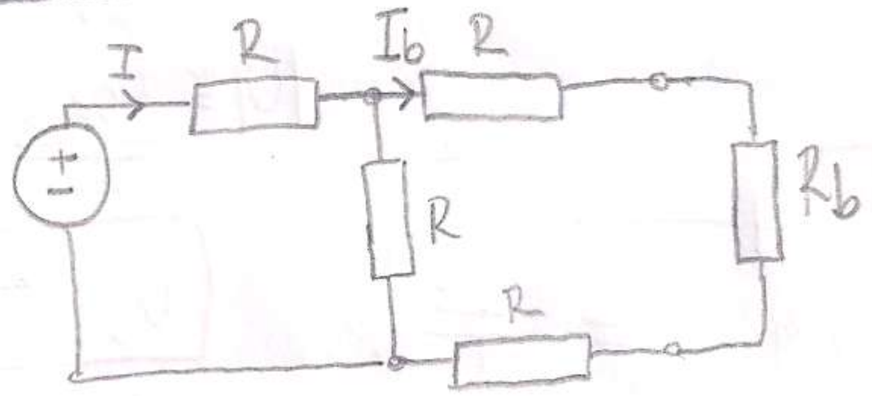
$= 1001\,\Omega(1 + 10^{-4} K^{-1} \cdot (-30°C)) = 997{,}9\,\Omega$

$R_{-10°C} < 1\,k\Omega$

Kol. 2. VSS 31.1.2011

4) $U = 2V$

$R = 5\Omega$



a) $R_b = ?$, da bo P_{max}

$R_b = R_N = R \| R + R + R =$

$= \frac{5\Omega \cdot 5\Omega}{5\Omega + 5\Omega} + 5\Omega + 5\Omega = 12{,}5\Omega$

b) $R_b' = R$

$I_b = ?$

$I = \frac{U}{R_N} = \frac{2V}{8{,}75\Omega} = 228{,}57\,mA$

$R_N = (R + R + R \| R) + R = \left(\frac{15\Omega \cdot 5\Omega}{15\Omega + 5\Omega}\right) + 5\Omega = 8{,}75\,\Omega$

$I_b = I \cdot \frac{R}{R + 3R} = 228{,}57\,mA \cdot \frac{5\Omega}{20\Omega} = 57{,}14\,mA$

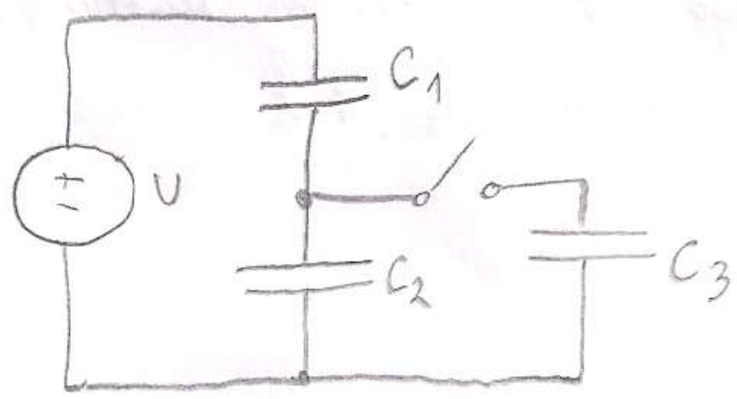
---

5) $C_1 = 4{,}5\,nF$

$C_2 = 3\,nF$

$C_3 = 1{,}5\,nF$

$U = 5V$



a) U_{C2} (pred vklopom) $U_{C2} = U \cdot \frac{C_1}{C_1 + C_2} = 5V \cdot \frac{4{,}5nF}{4{,}5nF + 3nF} = 3V$

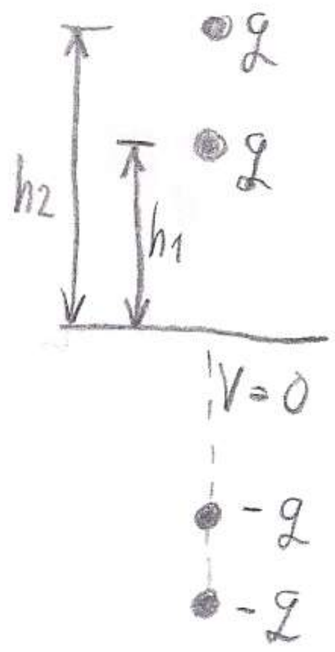
b) W_{C3} (po vklopu)

$U_3 = U \cdot \frac{C_1}{C_1 + C_2 + C_3} = 5V \cdot \frac{4{,}5nF}{9\,nF} = 2{,}5V$

$W_{C3} = \frac{C_3 U_3^2}{2} = \frac{1{,}5 \cdot 10^{-9} F \cdot (2{,}5V)^2}{2} = 4{,}69\,nJ$

Kol 2. VSŠ 16.1.2007

1)



$h_1 = 4m$

$h_2 = 6m$

$q_1 = 48nC/m$

$q_2 = ?$ (da bo $E_e = 0$)

↓

mora biti

$E = 0$

$$E = \frac{1}{2\pi\varepsilon_0}\left|\frac{q_2}{h_2-h_1} - \frac{-q_1}{2h_1} - \frac{-q_2}{h_2+h_1}\right| = 0$$

⇓

$$\frac{q_2}{h_2-h_1} + \frac{q_2}{h_2+h_1} = \frac{-q_1}{2h_1}$$

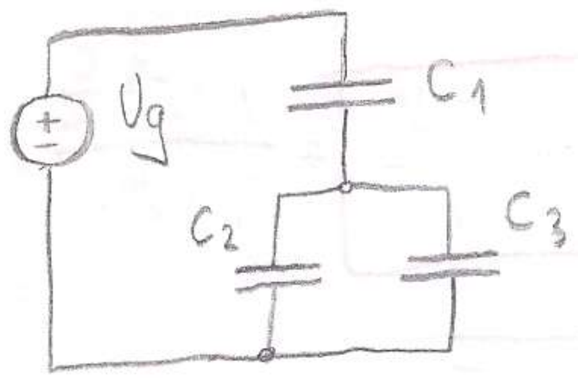
$$q_2\left(\frac{1}{h_2-h_1} + \frac{1}{h_2+h_1}\right) = \frac{-q_1}{2h_1}$$

$$q_2 = \frac{-q_1}{2h_1\left(\frac{1}{h_2-h_1} + \frac{1}{h_2+h_1}\right)}$$

$$= \frac{-48\,nC}{2\cdot 4m\left(\frac{1}{2m} + \frac{1}{10m}\right)} = -10\,nC/m$$

Kol. 2. VSŠ 16.1.2007

2.)



$C_1 = 3nF$
$C_2 = 1nF$
$C_3 = 2nF$
$\varepsilon_r = 2$

$\Delta W = ?$ (ko vstavimo dielektrik)

$C_{23} = \underline{\underline{3nF}} = C_1$

$U_{23} = \frac{U_g}{2}$

$W = \frac{CU^2}{2}$

$C_{1d} = 6nF \rightarrow \frac{1}{3} U_g$
$C_{23} = 2nF \rightarrow \frac{2}{3} U_g$

$C_{1d} = \varepsilon_r C_1 = 2(C_2 + C_3) = 2(1+2) = 6nF$

$U_{1d} = \frac{U_g}{3} \rightarrow U_{23d} = \frac{2U_g}{3}$

$W_3 = C_3 U_{23}^2 / 2$ $\quad W_{3d} = C_3 U_{23d}^2 / 2$

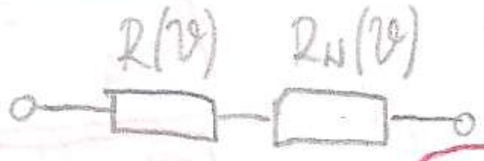
$$\frac{W_{3d} - W_3}{W_3} = \frac{U_{23d}^2 - U_{23}^2}{U_{23}^2} = \frac{\left(\frac{2}{3}\right)^2 - \left(\frac{1}{2}\right)^2}{\left(\frac{1}{2}\right)^2}$$

$$= \frac{\frac{4}{9} - \frac{1}{4}}{\frac{1}{4}} = \underline{77{,}8\,\%}$$

---

3) $R(20°) = 10\Omega$
$R(80°) = 12{,}4\Omega$

$R_N = ?$, da bo $R_N = 90\Omega = R_{zap}$
$\alpha_N = ?$



$R(80°) = R(20°)[1 + \alpha(80° - 20°)]$

$\alpha = \frac{\frac{R(80)}{R(20)} - 1}{\Delta\vartheta} = \frac{\frac{12{,}4\Omega}{10\Omega} - 1}{60°} = \underline{4 \cdot 10^{-3} K^{-1}}$

$R_{zap} = R(\vartheta_0) + R_N(\vartheta_0)$

$R_N(\vartheta_0) = R_{zap} - R(\vartheta_0) = 90\Omega - 10\Omega = 80°$

Da bo upornost neodvisna od temperature

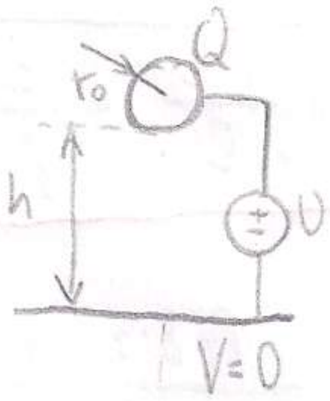
$R(\vartheta_0)\alpha + R_N(\vartheta_0)\alpha_N = 0$

$\alpha_N = -\alpha \frac{R(\vartheta_0)}{R_N(\vartheta_0)} = -0{,}004 K^{-1} \frac{10\Omega}{80\Omega} = -0{,}0005 K^{-1} = -5 \cdot 10^{-4} K^{-1}$

---

7) $h = 0{,}6\,m$
$r_0 = 25\,cm$
$U = 300V$
$\underline{Q = 9{,}51\,nC}$

$C = ?$, med krogla in tlemi

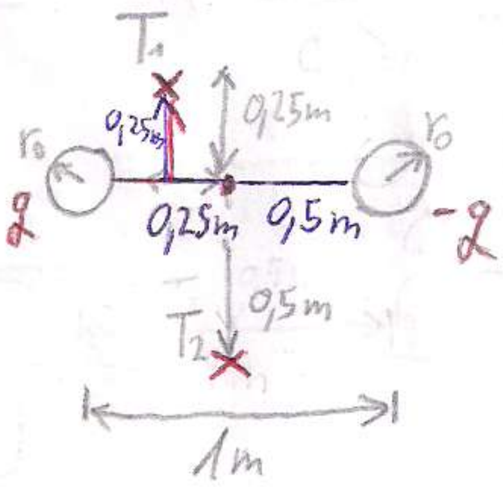


$C = \frac{Q}{U} = \frac{9{,}51nC}{300V} = \underline{3{,}17\,pF}$

Kol. 2 VSŠ 18.1.2006

1.) $r_0 = 2\,cm$
$\pm Q = 10^{-9} C/m$

$U = V(T_1) - V(T_2) = ?$



$T_1(x = -0{,}25m, y = 0{,}25m)$
$T_2(x = 0, y = -0{,}5m)$

$V(T_1) = \frac{Q}{2\pi\varepsilon_0} \ln \frac{r_-}{r_+}$

$V(T_1) = \frac{10^{-9} C/m}{2\pi \cdot 8{,}854 \cdot 10^{-12} \frac{As}{Vm}} \cdot \ln \frac{0{,}791m}{0{,}354m}$

$\approx 14{,}45V \cong \underline{14{,}5V}$

$r_- = \sqrt{(0{,}75m)^2 + (0{,}25m)^2} = \underline{0{,}791\,m}$

$V(T_2) = 0$

$r_+ = \sqrt{(0{,}25m)^2 + (0{,}25m)^2} = \underline{0{,}354\,m}$

$U = V(T_1) = \underline{14{,}5V}$

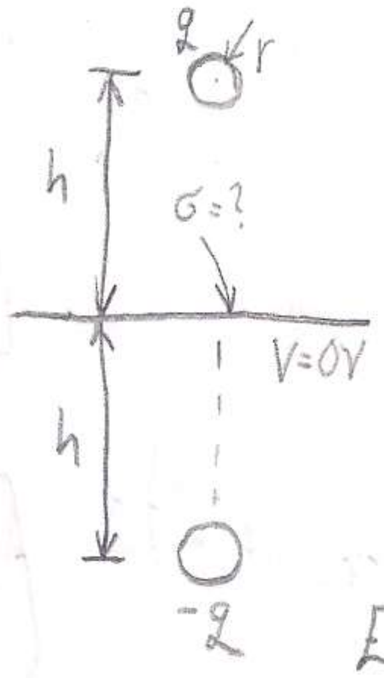
Kol. 2. VŠS 18.1.2006

2) $q = 2mC/m = 2\cdot10^{-3}\frac{C}{m}$

$r = 1cm = 0{,}01m$

$h = 10m$

$\sigma(T_0) = ?$



$$\sigma(T_0) = \frac{-q}{\pi\cdot h} = \frac{-2\cdot10^{-3}\frac{C}{m}}{\pi\cdot 10m} = -63{,}66\frac{\mu C}{m^2}$$

$$= -63{,}7\frac{\mu C}{m^2}$$

$$\sigma(T_0) = \varepsilon_0 E_n(T_+)$$

$$E_n(T_+) = -\frac{q}{2\pi\varepsilon_0 h} + \frac{(-q)}{2\pi\varepsilon_0 h} = \frac{-2q}{2\pi\varepsilon_0 h}$$

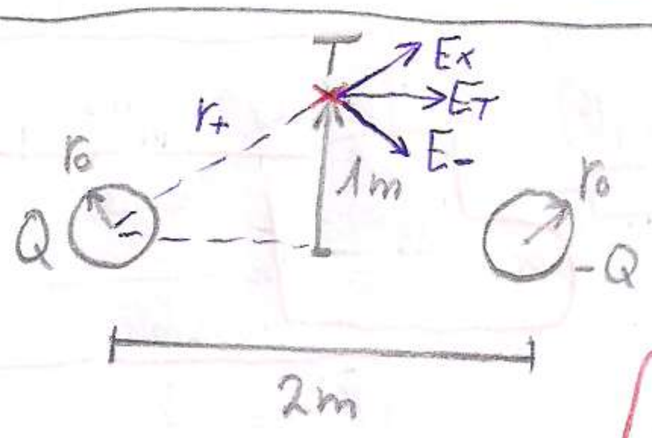
$$E_n(T_+) = -\frac{q}{\pi\varepsilon_0 h}$$

3) $r_0 = 0{,}1m$

$\pm Q = 10^{-9}C$

$w(T) = ?$

$T(x=0, y=1m)$



$$w_e = \frac{\varepsilon_0 E_T^2}{2} = \frac{\varepsilon_0\cdot(6{,}36\,V/m)^2}{2} = 0{,}179\frac{nJ}{m^3}$$

$$E_T = 2E_+\cos 45° = \sqrt{2}E_+ = 6{,}36\,V/m$$

$$E_+ = \frac{Q}{4\pi\varepsilon_0 r_+^2} = \frac{10^{-9}C}{4\pi\varepsilon_0(\sqrt{2}m)^2} = 4{,}5\,V/m$$

$$r_+ = \sqrt{1^2+1^2} = \sqrt{2}m$$

5) $r_n = 5mm$

$r_z = 14mm$

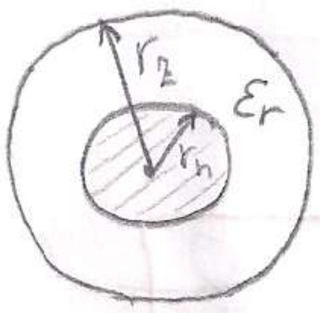
$\varepsilon_r = 7\varepsilon_0$, $\varepsilon = \varepsilon_0\cdot 7\varepsilon_0 = 8\cdot\varepsilon_0$

$\varepsilon = \varepsilon_r\varepsilon_0$

$\gamma = 10^{-13}S/m$

$U = 10kV$

$l = 1km$



$$R\cdot C = \rho\varepsilon$$

$$R = \frac{\rho\varepsilon}{C} = \frac{\varepsilon}{\gamma C}$$

$$C = \frac{2\pi\varepsilon l}{\ln\frac{r_z}{r_n}} = \frac{2\pi\cdot 8\cdot\varepsilon_0\cdot 1000m}{\ln\frac{14}{5}} = 432nF$$

$$R = \frac{8\cdot\varepsilon_0}{10^{-13}\frac{S}{m}\cdot 432\cdot10^{-9}F} = 1{,}64\,G\Omega$$

$$I = \frac{U}{R} = \frac{10000V}{1{,}64\cdot10^9\Omega} = 6{,}1\,\mu A$$

2 kol 10.1.2005 VSŠ

1.) $r_0 = 5m$

$\rho = -10^{-7} \frac{As}{m^3}$

$r_1 = 10m$

$\vec{E}_{r_1} = ?$

$$E_r = \frac{\rho r_0^3}{3 \varepsilon_0 r_1^2} = \frac{10^{-7} \frac{As}{m^3} \cdot (5m)^3}{3 \cdot \varepsilon_0 \, (10m)^2} = \underline{4{,}7 \, kV/m}$$

$$\vec{E} = \underline{\underline{-4{,}7 \, kV/m \cdot \vec{e}_r}}$$

---

3) $r_0 = 5mm$

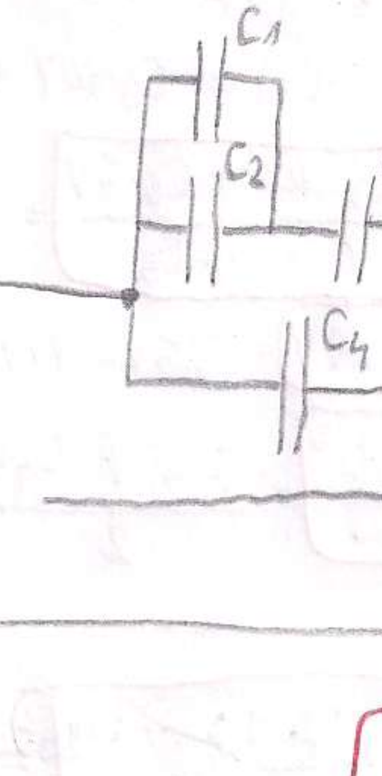
$q_1 = 2 \cdot 10^{-9} \frac{C}{m}$

$q_2 = 0$

$h_1 = 5m$

$h_2 = 4m$

$V_2 = ?$



$$V_2 = \frac{q_1}{2\pi\varepsilon_0} \ln \frac{h_1 + h_2}{h_1 - h_2}$$

$$= \frac{2 \cdot 10^{-9} \frac{C}{m}}{2\pi\varepsilon_0} \ln \frac{9m}{1m}$$

$$V_2 = \underline{\underline{78{,}99 \, V}}$$

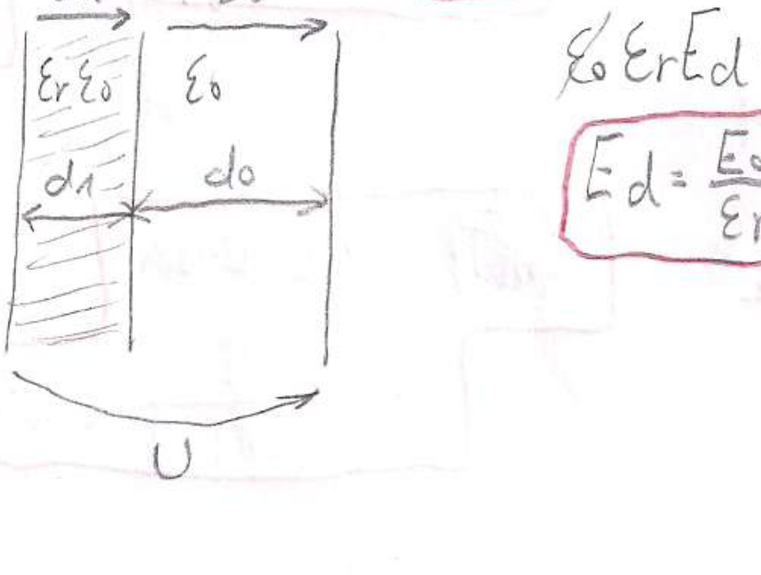
---

5) $C_1 = C_2 = 2\mu F$

$C_3 = 4\mu F$

$C_4 = 6\mu F$

$Q_1 = ?$



$$U_1 = \frac{C_3}{C_1 + C_2 + C_3} \cdot U = \frac{4\mu F}{2\mu F + 2\mu F + 4\mu F} \cdot 500V$$

$$U_1 = \underline{250 \, V}$$

$$Q_1 = C_1 U_1 = 2\mu F \cdot 250V$$

$$= \underline{0{,}5 \, mC}$$

Kol 2 VSŠ 14.1.2004

2.) $d_0 = 1mm$

$d_1 = 0{,}5mm$

$\varepsilon_r = 4$

$E_0 = 4 kV/m$

$U = ?$

$$U = U_d + U_0 = E_d d_1 + E_0 d_0 = \frac{E_0}{\varepsilon_r} d_1 + E_0 d_0$$

$$\varepsilon_0 \varepsilon_r E_d = \varepsilon_0 E_0$$

$$E_d = \frac{E_0}{\varepsilon_r}$$

$$= \frac{4000V}{4} \cdot 0{,}5mm + 4000V \cdot 1mm$$

$$U = 0{,}5V \cdot 4V = \underline{4{,}5 \, V}$$

Kol 2 VSS 14.1.2004

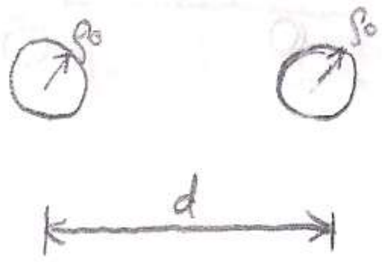
3.) $s_0 = 1mm$

$d = 1m$

$U_0 = 1kV$

$l = 1km$

$\frac{W}{l} = ?$



$$W = \frac{CU^2}{2} = \frac{4 \cdot 10^{-9} F \cdot (1000V)^2}{2} = \underline{\underline{2mJ}}$$

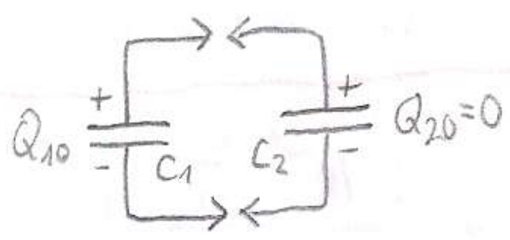
$$C = \frac{\pi \varepsilon_0 l}{\ln \frac{d}{s_0}} = \frac{\pi \varepsilon_0 \cdot 1000m}{\ln \frac{1}{0,001}} = \underline{4nF}$$

4.) $C_1 = 3nF$

$C_2 = 1nF$

$\underline{Q_{10} = 40nC}$

$Q_2 = ?$ (po poveznici)



$$Q_1 + Q_2 = Q_{10} + Q_{20} = 40nC$$

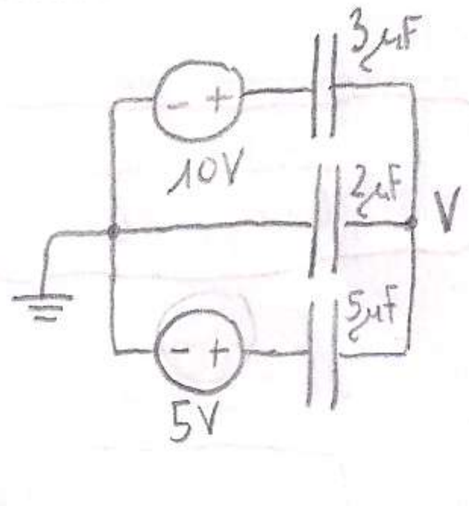
$$U_1 = U_2 \Rightarrow \frac{Q_1}{C_1} = \frac{Q_2}{C_2} \Rightarrow Q_1 = C_1 \frac{Q_2}{C_2} = \frac{3}{1} Q_2$$

$$3Q_2 + Q_2 = 40nC$$

$$Q_2 = 40nC / 4 = \underline{\underline{10nC}}$$

Kol 2 VSS 23.1.2003

1) $W_3 = ?$



$$Q_3 + Q_2 + Q_5 = 0 \Rightarrow C_3 U_3 + C_2 U_2 + C_5 U_5$$

$$C_3 (V - 10V) + C_2 V + C_5 \cdot (V - 5V) = 0$$

$$V(C_3 + C_2 + C_5) = C_3 \cdot 10V + C_5 \cdot 5V$$

$$V = \frac{C_3 \cdot 10V + C_5 \cdot 5V}{C_3 + C_2 + C_5} = \frac{3 \cdot 10V + 5 \cdot 5V}{3 + 2 + 5} = \underline{5,5V}$$

$$U_3 = V - 10V = 5,5V - 10V = -4,5V$$

$$W_3 = \frac{C_3 \cdot U^2}{2} = \frac{3 \cdot 10^{-6} F \cdot (-4,5V)^2}{2} = \underline{\underline{30,38 \mu J}}$$

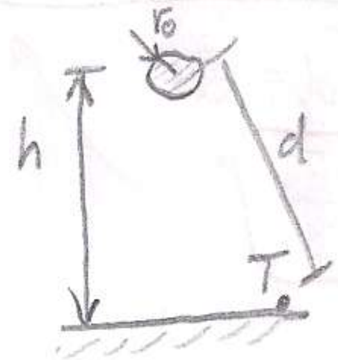
Kol. 2 VSS 21.1.2003

1.) $r_0 = 3cm$

$h = 5m$

$\underline{U = 20kV}$

$E(T) = ?, d = 6m$



$$V = \frac{Q}{2\pi\varepsilon_0} \ln \frac{2h}{r} \Rightarrow Q = \frac{V \cdot 2\pi\varepsilon_0}{\ln \frac{2h}{r}} = \frac{20kV \cdot 2\pi\varepsilon_0}{\ln \frac{10m}{0,03m}}$$

$$Q = 191 nC/m$$

$$E_h(T) = 2E \cos\alpha$$

$$= 2 \cdot \frac{Q}{2\pi\varepsilon_0 d} \cos\alpha$$

$$\cos\alpha = \frac{h}{d} = \frac{5}{6} = 0,83$$

$$= 2 \cdot \frac{191 \cdot 10^{-9} C/m}{2\pi\varepsilon_0 \cdot 6m} \cdot 0,83$$

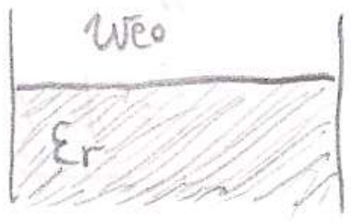
$$E_h(T) = \underline{\underline{949,88 V/m}}$$

Kol. 2. VSS 21.1.2003

2.) $w_{e0} = 3\,J/m^3$

$\varepsilon_r = 4\varepsilon_0$

$w_{ed} = ?$



$D_0 = D_d \Rightarrow \varepsilon_0 E_0 = \varepsilon_0 \varepsilon_r E_d$

$E_d = \frac{E_0}{\varepsilon_r}$

$w_{e0} = \frac{\varepsilon_0 E_0^2}{2} \Rightarrow E_0 = \sqrt{\frac{2 w_{e0}}{\varepsilon_0}} = \sqrt{\frac{2 \cdot 3\,J/m^3}{\varepsilon_0}}$

$= \left(823{,}76\,\frac{V}{m}\right)$

$E_d = \frac{E_0}{\varepsilon_r} = \left(205{,}94\,\frac{V}{m}\right)$

$w_{ed} = \frac{\varepsilon \cdot E_d^2}{2} = \frac{\varepsilon_r \varepsilon_0 E_d^2}{2} = \left(0{,}75\,\frac{J}{m^3}\right)$

Kol 2 VSS 17.1.2002

4.) Sferični kondenzator

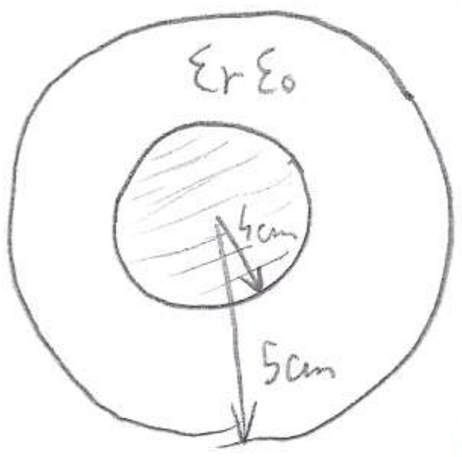
$\varepsilon_r = 5$

$U = 300V$

$r_1 = 4cm$

$r_2 = 5cm$

$W = ?$



$E(r) = \frac{Q}{4\pi\varepsilon r^2}$

$U = \frac{Q}{4\pi\varepsilon}\left(\frac{1}{r_1} - \frac{1}{r_2}\right)$

$Q = \frac{4\pi\varepsilon U}{\frac{1}{r_1} - \frac{1}{r_2}} = \frac{4\pi \cdot 5 \cdot \varepsilon_0 \cdot 300V}{\frac{1}{0{,}04m} - \frac{1}{0{,}05m}}$

$\varepsilon = \varepsilon_0 \cdot \varepsilon_r$

$W = \frac{Q \cdot U}{2} = \frac{33nC \cdot 300V}{2} = \underline{\underline{5\mu J}}$

$Q = 33nC$

Kol 2 VSS 11.1.2002

3) $U = 6kV$

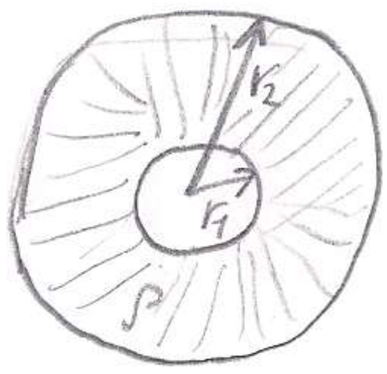
$I = 3mA$

$r_1 = 1cm$

$r_2 = 4cm$

$l = 1km$

$\rho = ?$



$R_d = \frac{U}{I} = \frac{6000V}{0{,}003A} = \underline{2M\Omega}$

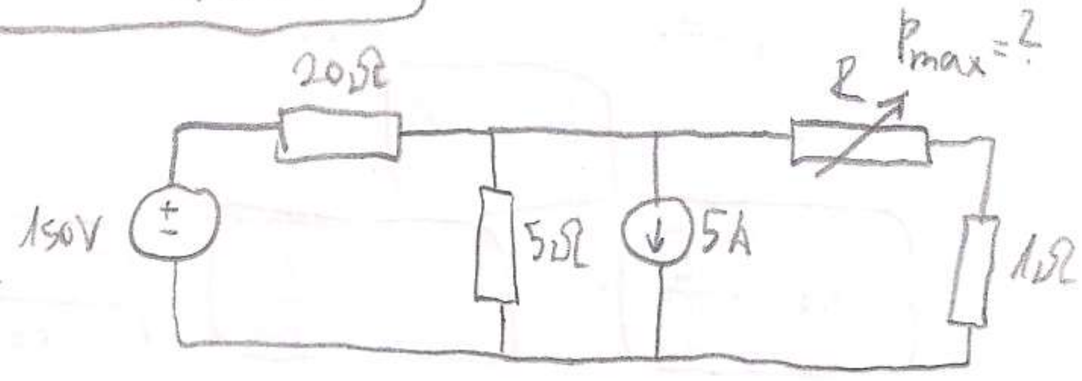
$R_d = \frac{\rho}{2\pi l} \ln \frac{r_2}{r_1}$

$\rho = \frac{R_d \cdot 2\pi l}{\ln \frac{r_2}{r_1}} = \frac{2 \cdot 10^6 \Omega \cdot 2\pi \cdot 1000m}{\ln \frac{4}{1}}$

$\rho = \underline{\underline{9{,}06 \cdot 10^9 \Omega m}}$

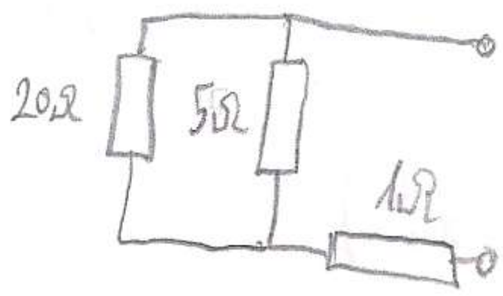
Kol 2 VSS 19.1.2000

5.)



$$U_{th} = 150V \cdot \frac{5\Omega}{20\Omega + 5\Omega} - 20||5 \cdot 5A$$

$$= \underline{\underline{10V}}$$



$$R_{th} = (20||5) + 1 = 4\Omega + 1\Omega = \underline{\underline{5\Omega}}$$

$$P_{max} = \frac{U_{th}^2}{4 \cdot R_{th}} = \frac{(10V)^2}{4 \cdot 5\Omega} = \underline{\underline{5W}}$$