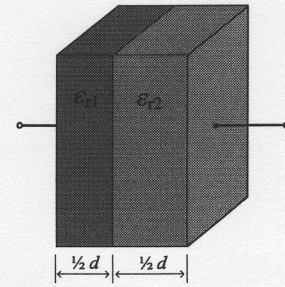
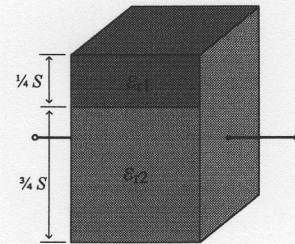


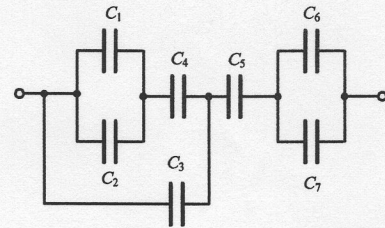
1. Med ravnima kovinskima ploščama površine $S = 0,5 \text{ m}^2$ sta zaporedno nameščena dielektrika z $\epsilon_{r1} = 3$ in $\epsilon_{r2} = 5$. Na plošči je pritisnjena napetost U tako, da sta plošči naelektreni z nabojem $Q = 2 \cdot 10^{-6} \text{ As}$, razdalja med ploščama pa je $d = 6 \text{ cm}$. Izračunajte napetosti na posameznih dielektrikih in kapacitivnost tega ploščatega kondenzatorja.



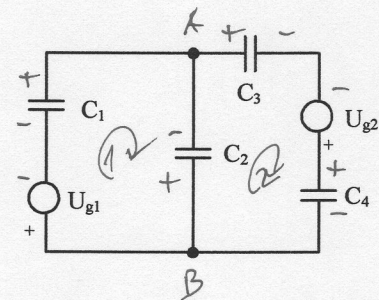
2. Med ravnima kovinskima ploščama površine $S = 0,25 \text{ m}^2$ sta vzporedno nameščena različna dielektrika z $\epsilon_{r1} = 4$ in $\epsilon_{r2} = 3$. Med plošči je pritisnjena napetost $U = 10 \text{ kV}$, razdalja med ploščama pa je $d = 2 \text{ cm}$. Izračunajte kakšen je celoten naboj na ploščah in kakšna je kapacitivnost tega ploščatega kondenzatorja.



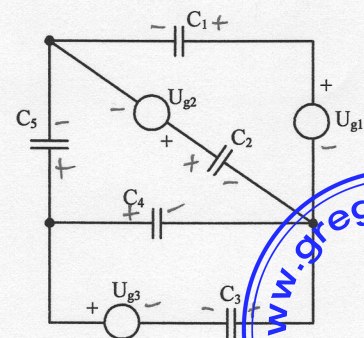
3. Kako se porazdeli napetost 600 V na kondenzatorje v podanem vezju?
 $C_1 = 10 \text{ pF}$, $C_2 = 10 \text{ pF}$, $C_3 = 20 \text{ pF}$, $C_4 = 20 \text{ pF}$,
 $C_5 = 30 \text{ pF}$, $C_6 = 20 \text{ pF}$, $C_7 = 10 \text{ pF}$



4. V podanem vezju izračunajte napetosti na kondenzatorjih.
 $U_{g1} = 50 \text{ V}$, $U_{g2} = 100 \text{ V}$,
 $C_1 = 8 \text{ nF}$, $C_2 = 6 \text{ nF}$, $C_3 = 3 \text{ nF}$, $C_4 = 10 \text{ nF}$



5. Po metodi Kirchofovih zakonov izračunajte napetosti na kondenzatorjih.
 $U_{g1} = 10 \text{ V}$, $U_{g2} = 13 \text{ V}$, $U_{g3} = 16 \text{ V}$
 $C_1 = 2 \text{ pF}$
 $C_2 = 8 \text{ pF}$
 $C_3 = 1 \text{ pF}$
 $C_4 = 4 \text{ pF}$
 $C_5 = 6 \text{ pF}$



Rešitve

$$\begin{aligned} U_1 &= 4524 \text{ V} \\ 1. \quad U_2 &= 2715 \text{ V} \\ C &= 276,56 \text{ pF} \end{aligned}$$

$$\begin{aligned} 2. \quad Q &= 3,6 \cdot 10^{-6} \text{ As} \\ C &= 360 \text{ pF} \end{aligned}$$

$$3. \quad U = \begin{bmatrix} 100 \\ 100 \\ 200 \\ 100 \\ 200 \\ 200 \\ 200 \end{bmatrix} \text{ V}$$

$$4. \quad U = \begin{bmatrix} -11,3 \\ 38,67 \\ 47,1 \\ 14,1 \end{bmatrix} \text{ V}$$

$$5. \quad U = \begin{bmatrix} 15,9 \\ 7,08 \\ 17,77 \\ -1,7 \\ 4,14 \end{bmatrix} \text{ V}$$

$$S = 0,5 \text{ m}^2$$

$$\epsilon_{r1} = 3$$

$$\epsilon_{r2} = 5$$

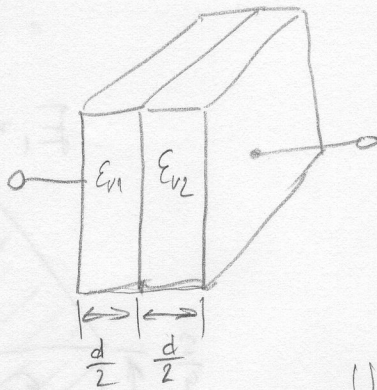
$$Q = 2 \cdot 10^{-6} \text{ As}$$

$$d = 6 \text{ cm} = 0,06 \text{ m} \quad 6 \cdot 10^{-2}$$

$$U_2 = ?$$

$$U_1 = ?$$

$$C = ?$$



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$$\epsilon_0 = \frac{\Delta\phi}{V/m}$$

$$U = E \cdot d$$

$$E = \frac{D}{\epsilon_0 \epsilon_r}$$

$$D = \frac{Q}{A}$$

$$C = \frac{Q}{U}$$

$$D = \frac{2 \cdot 10^{-6} \text{ As}}{0,5 \text{ m}^2} = 4 \cdot 10^{-6} \frac{\text{As}}{\text{m}^2}$$

$$V/m \cdot m = V$$

$$U_1 = E_1 \cdot d_1$$

$$U_1 = 150,59 \cdot 10^3 \cdot 3 \cdot 10^{-2}$$

$$U_1 = 4517,7 \text{ V}$$

$$E_1 = \frac{D}{\epsilon_0 \epsilon_{r1}} = \frac{4 \cdot 10^{-6} \frac{\text{As}}{\text{m}^2}}{\epsilon_0 \cdot 3 \frac{\text{As}}{\text{Vm}}} = 150,59 \cdot 10^3 \text{ V/m}$$

$$E_2 = \frac{D}{\epsilon_0 \epsilon_{r2}} = \frac{4 \cdot 10^{-6}}{\epsilon_0 \cdot 5} = 90,35 \cdot 10^3 \text{ V/m}$$

$$U_2 = E_2 \cdot d_2$$

$$U_2 = 9035 \cdot 10^3 \cdot 3 \cdot 10^{-2}$$

$$U_2 = 2710,5 \text{ V}$$

$$C = \frac{DA}{U} = \frac{4 \cdot 10^{-6} \cdot 0,5}{7228,2} = 276,69 \cdot 10^{-12} \text{ F} = 276,69 \text{ pF}$$

$$U = U_1 + U_2 = 7228,2 \text{ V}$$

(1)

DU 4/2

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Gregor N
Nikolic

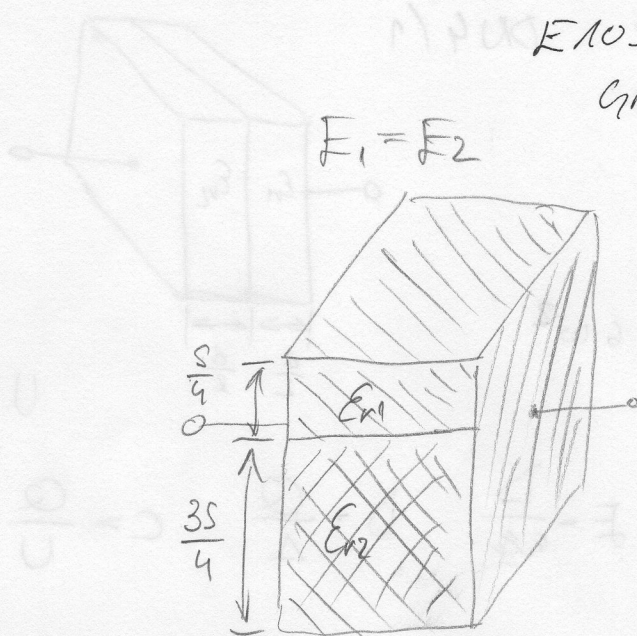
$$S = 0.25 \text{ m}^2$$

$$\epsilon_m = 4$$

$$\epsilon_{v2} = 3$$

$$U = 10 \text{ kV}$$

$$d = 2 \text{ cm} = 2 \cdot 10^{-2} \text{ m}$$



$$C = \frac{Q}{U} \quad U = E \cdot d \quad D = \frac{Q}{A} \quad E = \frac{D}{\epsilon_0 \epsilon_r}$$

$$Q = ? \quad E = \frac{U}{d}$$

$$C = ? \quad E = \frac{10 \cdot 10^3}{2 \cdot 10^{-2}} = 500 \cdot 10^3 \text{ V/m}$$

$$Q_1 = D_1 \cdot \frac{S}{4}$$

$$Q_1 = 1,107 \cdot 10^{-6} \text{ As}$$

$$Q_2 = D_2 \cdot \frac{3S}{4}$$

$$Q_2 = 2,49 \cdot 10^{-6} \text{ As}$$

$$D_1 = E \cdot \epsilon_0 \epsilon_{r1} = 500 \cdot 10^3 \cdot \epsilon_0 \cdot 4$$

$$D_1 = 17,708 \cdot 10^{-6} \frac{\text{As}}{\text{m}^2}$$

$$D_2 = E \cdot \epsilon_0 \epsilon_{r2} = 13,281 \cdot 10^{-6} \frac{\text{As}}{\text{m}^2}$$

$$Q = Q_1 + Q_2 = 3,597 \cdot 10^{-6} \text{ As}$$

$$C = \frac{Q}{U} = 359,72 \cdot 10^{-12} \frac{\text{As}}{\text{V}} = F$$

$$\underline{\underline{359,72 \text{ pF}}}$$

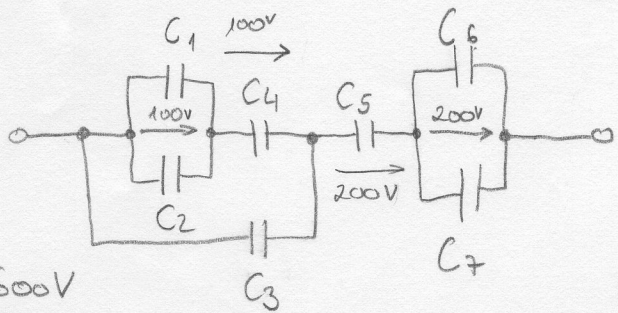
(2)



DEJE DN4, 600V

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3.



- $U_1 = 100V$
- $U_2 = 100V$
- $U_3 = 200V$
- $U_4 = 100V$
- $U_5 = 200V$

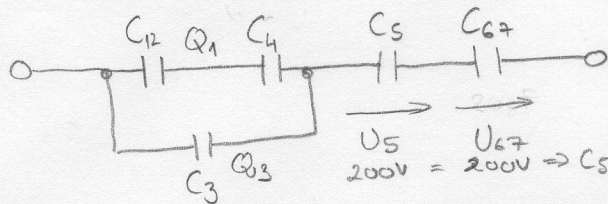
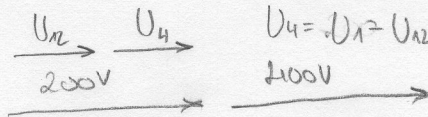
- $U_6 = 200V$
- $U_7 = 200V$

GRAD
NIKOLIĆ

- $U = 600V$
- $C_1 = 10 pF$
- $C_2 = 10 pF$
- $C_3 = 20 pF$
- $C_4 = 20 pF$
- $C_5 = 30 pF$
- $C_6 = 20 pF$
- $C_7 = 10 pF$

$$U_{12} = \frac{Q_1}{C_{12}} = 100V$$

$$U_4 = U_1 = U_{12} = 100V$$



$$C_{67} = C_6 + C_7 = 30 pF$$

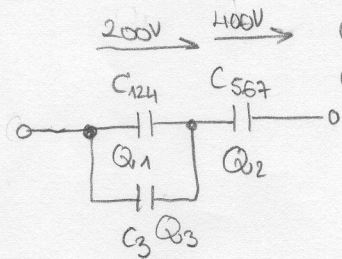
$$C_{12} = C_1 + C_2 = 20 pF$$

$$Q_{11} = C_{124} \cdot U_1 = 2 \cdot 10^{-9} As$$

$$U_1 = \frac{Q}{C_{1234}} = 200V$$

$$U_2 = U - U_1 = 400V$$

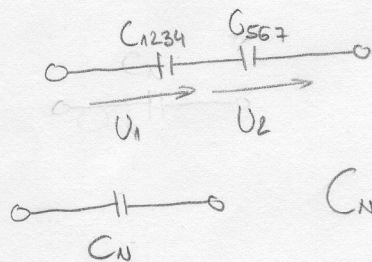
$$\left(U_2 = \frac{Q}{C_{567}} = 400V \right)$$



$$C_{124} = \left(C_{12}^{-1} + C_4^{-1} \right)^{-1} = 10 pF$$

$$C_{567} = \left(C_{67}^{-1} + C_5^{-1} \right)^{-1} = 15 pF$$

$$C_{1234} = C_{124} + C_3 = 30 pF$$



$$C_N = \left(C_{1234}^{-1} + C_{567}^{-1} \right)^{-1} = 10 pF$$

$$C = \frac{Q}{U}$$

$$Q_{1N} = C_N \cdot U = 10 \cdot 10^{-12} \cdot 600 = 6 \cdot 10^{-9} As$$

$$Q = C \cdot U$$

$$U = \frac{Q}{C}$$

3



A: $Q_0 + Q_1 - Q_2 = \phi$

A: $C_3 U_3 + C_1 U_1 - C_2 U_2 = \phi$

1) $U_{g1} - U_1 - U_2 = \phi$

$3U_3 + 8U_1 - 6U_2 = \phi$

2) $-U_{g2} + U_4 + U_2 + U_3 = \phi$

B: $-Q_1 + Q_2 - Q_4 = \phi$

$-8U_1 + 6U_2 - 10U_4 = \phi$

$U_3 = U_{g2} - U_4 - U_2$

$U_1 = U_{g1} - U_2$

$U_3 = 100 - 14,152 - 38,68$

$U_3 = 47,168 \text{ V}$

$3(100 - U_4 - U_2) + 8(50 - U_2) - 6U_2 = \phi$

$300 - 3U_4 - 3U_2 + 400 - 8U_2 - 6U_2 = 0$

$700 - 3U_4 - 17U_2 = \phi$

$-8(50 - U_2) + 6U_2 - 10U_4 = \phi$

$-400 + 8U_2 + 6U_2 - 10U_4 = 0$

$-400 + 14U_2 - 10U_4 = 0$

$U_4 = \frac{+400 - 14 \cdot 38,68}{-10}$

$U_4 = 14,152$

$U_1 = U_{g1} - U_2$

$U_1 = 50V - 38,68V$

$U_1 = 11,32V$

$700 = 17U_2 + 3U_4 \quad / \cdot 10$

$400 = 14U_2 - 10U_4 \quad / \cdot 3$

$7000 = 170U_2 + 30U_4$

$1200 = 42U_2 - 30U_4$

$8200 = 212U_2$

$U_2 = 38,68 \text{ V}$

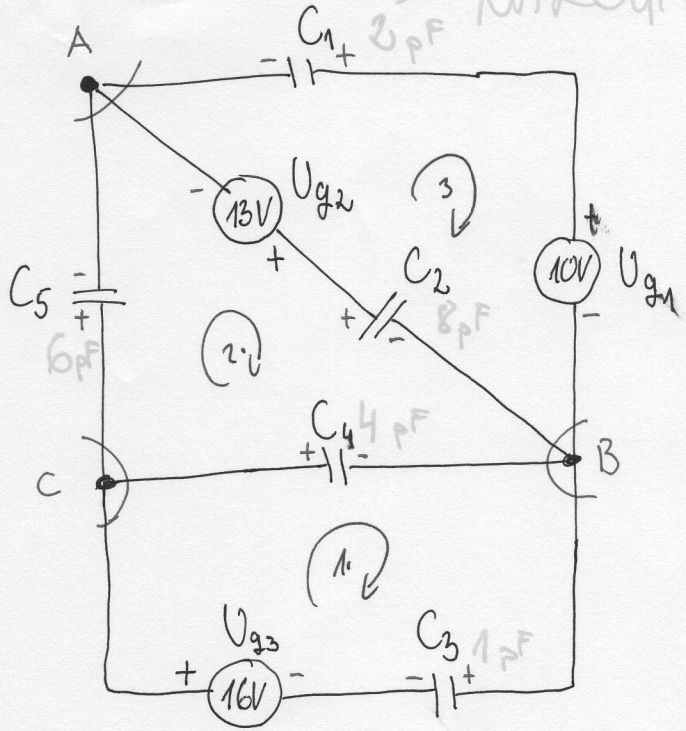


4

5. NATKOVA

GAOS 4209

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$$A: -Q_1 + Q_2 - Q_5 = \phi$$

$$B: Q_1 - Q_2 - Q_4 + Q_5 = \phi$$

$$C: Q_5 + Q_4 - Q_3 = \phi$$

$$1) -U_{g3} + U_4 + U_3 = \phi \Rightarrow U_3 = U_{g3} - U_4$$

$$2) -U_{g2} + U_2 - U_4 + U_5 = \phi \Rightarrow U_5 = U_{g2} - U_2 + U_4$$

$$3) +U_{g1} - U_2 + U_{g2} - U_1 = \phi \Rightarrow U_1 = U_{g1} - U_2 + U_{g2}$$

$$U_3 = U_{g3} - U_4 = 16 + 1,76 = 17,76 \text{ V}$$

$$U_5 = 13 - 7,09 + 1,76$$

~~$$B: 2U_1 - 8U_2 - 4U_4 + U_3 = \phi$$~~

$$U_5 = 4,15 \text{ V}$$

$$C: 6U_5 + 4U_4 - U_3 = \phi$$

$$A: 2U_1 + 8U_2 - 6U_5 = \phi$$

$$-2(10 - U_2 + 13) + 8U_2 - 6(13 - U_2 + U_4) = \phi$$

$$6(13 - U_2 + U_4) + 4U_4 - 16 + U_4 = \phi$$

$$-46 + 2U_2 + 8U_2 - 78 + 6U_2 - 6U_4 = \phi$$

$$78 + 6U_2 + 6U_4 + 4U_4 - 16 + U_4 = \phi$$

$$16U_2 - 6U_4 = 124$$

$$U_4 = \frac{124 - 16 \cdot 7,09}{-6} = -1,76 \text{ V}$$

$$-6U_2 + 19U_4 = -62$$

$$\begin{cases} 16U_2 - 6U_4 = 124 & / \cdot 1,317 \\ -6U_2 + 19U_4 = -62 & / \cdot 6 \end{cases} +$$

$$U_1 = U_{g1} - U_2 + U_{g2}$$

~~$$\begin{aligned} +12U_2 + 18U_4 &= 124 \\ 48U_2 - 18U_4 &= 372 \\ \hline 36U_2 &= 248 \\ U_2 &= 6,89 \text{ V} \end{aligned}$$~~

$$\begin{aligned} 176U_2 - 66U_4 &= 1364 \\ -36U_2 + 66U_4 &= -372 \\ \hline 140U_2 &= 992 \\ U_2 &= 7,09 \text{ V} \end{aligned}$$

$$U_1 = 10 - 7,09 + 13$$



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