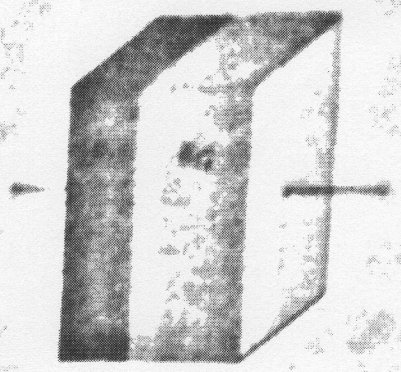
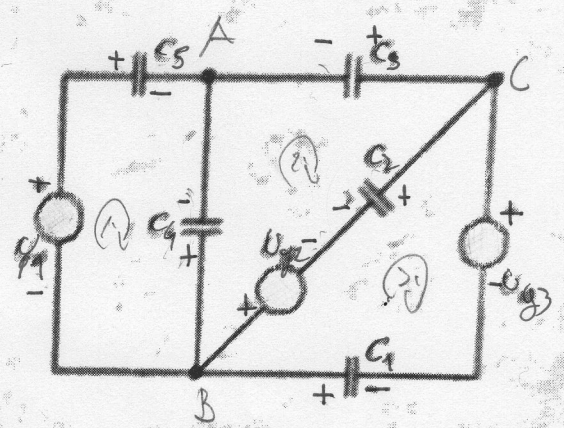


*kolobrnja & P*

1. Med ploščama površine  $S=10\text{cm}^2$  sta zaporedno nameščena dva dielektrika ( $\epsilon_{r1}=2$ ,  $\epsilon_{r2}=5$ ) debelin  $d_1=1\text{mm}$  in  $d_2=2\text{mm}$ . Na ploščah je nabran naboj  $Q=8,855 \cdot 10^{-9}\text{As}$ . Izračunajte celotno energijo električnega polja in kapacitivnost kondenzatorja.

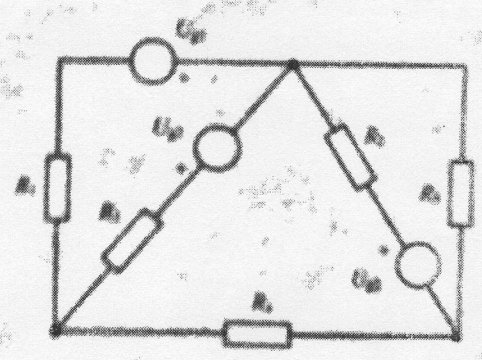


2. Z uporabo Kirchhoffovih zakonov izračunajte napetosti na posameznih kondenzatorjih.  
 $U_{g1} = 12\text{V}$ ,  $U_{g2} = 24\text{V}$ ,  $U_{g3} = 6\text{V}$ ;  
 $C_1 = 5\text{pF}$   
 $C_2 = 3\text{pF}$   
 $C_3 = 2\text{pF}$   
 $C_4 = 4\text{pF}$   
 $C_5 = 2\text{pF}$

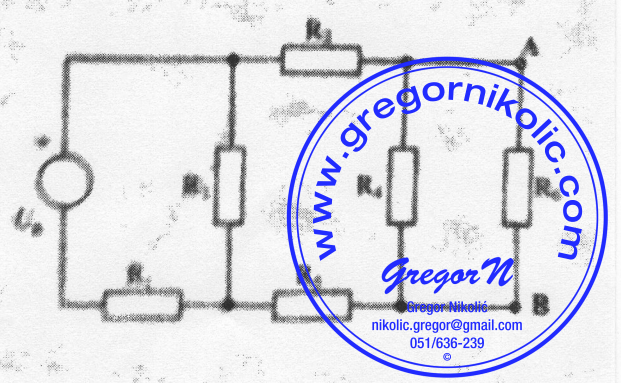


3. Ohmska upora imata pri  $20^\circ\text{C}$  upornosti  $R_{1,20}=10\ \Omega$  in  $R_{2,20}=5\ \Omega$ , ter sta vezana zaporedno. Temperaturni koeficient drugega upora znaša  $\alpha_2 = 4 \cdot 10^{-3}\ \text{C}^{-1}$ . Kolikšen je temperaturni koeficient prvega upora  $\alpha_1 = ?$ , če je poznan podatek, da je nadomestna upornost pri temperaturi  $t_2 = 70\ \text{C}$  za 40% večja kot pri  $20^\circ\text{C}$ .

4. Izračunajte tokove, ki tečejo preko ohmskih upornosti v vezju po metodi zančnih tokov.  
 $U_{g1} = 100\text{V}$ ,  $U_{g2} = 50\text{V}$ ,  $U_{g3} = 80\text{V}$ ,  
 $R_1 = R_2 = R_3 = 5\ \Omega$ ,  
 $R_4 = R_5 = 10\ \Omega$ .



5. Izračunajte tok preko upora  $R_6$  tako, da ostanek vezja nadomestite z aktivnim dvopolom - napetostnim izvorom (Theveninov teorem).  
 $R_1 = R_2 = R_3 = R_4 = R_5 = R_6 = 10\ \Omega$ ,  $U_g = 100\text{V}$ .



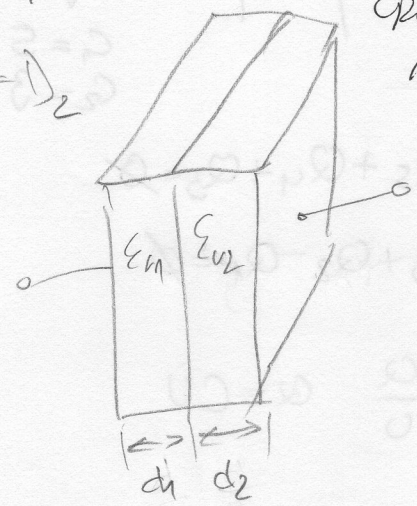
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kapaciteta  $\propto \beta$  (1054206)

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$$S = 10 \text{ cm}^2 = 10 \cdot 10^{-4} \text{ m}^2$$

$$d_1 = d_2$$



$$\epsilon_m = 2$$

$$\epsilon_{v2} = 5$$

$$d_1 = 1 \text{ mm} = 1 \cdot 10^{-3} \text{ m}$$

$$d_2 = 2 \text{ mm} = 2 \cdot 10^{-3} \text{ m}$$

$$Q = 8,855 \cdot 10^{-9} \text{ As}$$

$$W_e = \frac{Q \cdot U}{2} = \frac{U^2 C}{2} = \frac{Q^2}{2C} \quad [J]$$

C?

W<sub>e</sub>?

$$U = E \cdot d$$

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

$$D = \frac{Q}{A} \quad C = \frac{Q}{U}$$

$$D = \frac{8,855 \cdot 10^{-9} \text{ As}}{10 \cdot 10^{-4} \text{ m}}$$

$$D = 8,855 \cdot 10^{-6} \text{ As/m}$$

$$E_1 = \frac{D}{\epsilon_0 \epsilon_m} = 500,05 \cdot 10^3 \text{ V/m}$$

$$E_2 = \frac{D}{\epsilon_0 \epsilon_{v2}} = 200,02 \cdot 10^3 \text{ V/m}$$

$$U_1 = E_1 \cdot d_1 = 1000,10 \text{ V}$$

$$U_2 = E_2 \cdot d_2 = 200,02 \text{ V}$$

$$U = U_1 + U_2 = 1200,12 \text{ V}$$

$$C = \frac{Q}{U} = \frac{8,855 \cdot 10^{-9}}{1200,12 \cdot 10^3}$$

$$C = 7,38 \cdot 10^{-12} \text{ F}$$

$$W_e = \frac{Q \cdot U}{2} = 5,31 \cdot 10^{-6} \text{ AsV} \quad [W_s = J]$$

$$C = 7,38 \text{ pF}$$



①

Kolarny  $\alpha \beta$

$$U_{g1} = 12$$

$$U_{g2} = 24V$$

$$U_{g3} = 6V$$

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$$C_1 = 5$$

$$C_3 = 2$$

$$C_5 = 2$$

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$$C_2 = 3$$

$$C_4 = 4$$

$$A: Q_5 + Q_4 + Q_3 = 0$$

$$1) -U_{g1} + U_5 \quad U_4 = 0 \Rightarrow U_5 = U_{g1} + U_4 \Rightarrow \boxed{9,95V}$$

$$C: Q_3 + Q_2 - Q_1 = 0$$

$$2) -U_{g2} + U_4 - U_3 + U_2 = 0 \Rightarrow U_3 = U_4 + U_2 - U_{g2}$$

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

$$3) U_{g2} - U_2 + U_{g3} - U_1 = 0 \Rightarrow U_1 = U_{g2} - U_2 + U_{g3}$$

$$\boxed{U_1} = \boxed{9,79V}$$

$$\boxed{U_3} = \boxed{-5,84V}$$

$$A: C_5 U_5 + C_4 U_4 + C_3 U_3 = 0$$

$$2(12 + U_4) + 4U_4 + 2(U_4 + U_2 - 24) = 0$$

$$\underline{24} + \underline{2U_4} + \underline{4U_4} + \underline{2U_4} + \underline{2U_2} - \underline{48} = 0$$

$$8U_4 + 2U_2 - 24$$

$$\boxed{U_4} = \frac{-2 \cdot U_2 + 24}{8} = \boxed{-2,05V}$$

$$B: C_3 U_3 + C_2 U_2 \quad U_1 C_1 = 0$$

$$2(U_4 + U_2 - 24) + 3U_2 - 5(24 - U_2 + 6) = 0$$

$$\underline{2U_4} + \underline{2U_2} - \underline{48} + \underline{3U_2} - \underline{120} + \underline{5U_2} - \underline{30} = 0$$

$$2U_4 + 10U_2 = 198$$

$$8U_4 + 2U_2 = 24$$

$$2U_4 + 10U_2 = 198 \quad / \cdot (-4)$$

$$\begin{array}{r} -8U_4 - 40U_2 = 792 \\ 8U_4 + 2U_2 = 24 \end{array} \quad \left. \vphantom{\begin{array}{r} -8U_4 - 40U_2 = 792 \\ 8U_4 + 2U_2 = 24 \end{array}} \right\} +$$

$$-38U_2 = 768$$

$$\boxed{U_2} = \boxed{20,21V}$$

2

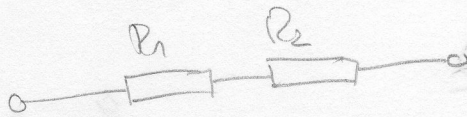


beležnik  $\alpha \beta$

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b)



$$R_{N_{20^\circ}} = 10 \Omega$$

$$Z_{20^\circ} = 5 \Omega$$

$$\alpha_2 = 4 \cdot 10^{-5} \text{ } ^\circ\text{C}^{-1}$$

$$\alpha_1 = ?$$

$$R_{N_{20^\circ}} = R_1 + R_2$$

$$R_{N_{70^\circ}} = \frac{7}{5} (R_1 + R_2)$$

$$\Delta V_2 = V - V_0 = 50^\circ\text{C}$$

$$R_{N_{20^\circ}} = R_1 (1 + \alpha_1 \Delta V_1) + R_2 (1 + \alpha_2 \Delta V_2)$$

$$\frac{7}{5} R_{N_{20^\circ}} = R_1 (1 + \alpha_1 \Delta V_1) + R_2 (1 + \alpha_2 \Delta V_2)$$

$$1) \quad R_{15} = 10 + 500 \alpha_1 + 5 + 250 \cdot 4 \cdot 10^{-5}$$

$$R_{15} = 16 + 500 \alpha_1$$

$$\frac{7}{5} \cdot 15 = 10 (1 + \alpha_1 \cdot 50) + 5 (1 + 4 \cdot 10^{-5} \cdot 50)$$

$$2) \quad R_{15} = 10 + 500 \alpha_1 + 5 + 6$$

$$\alpha_1 = \frac{R_{15} - 16}{500}$$

$$\alpha_1 = 0,01 = 10 \cdot 10^{-3} \text{ } ^\circ\text{C}^{-1}$$

$$\alpha_1 = -32 \cdot 10^{-3}$$

3

