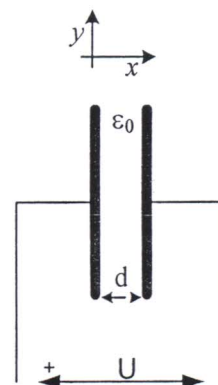


PRVI KOLOKVIJUM IZ ELEKTROTEHNIKE

25. novembar 2017.

GRUPA 1

1. Na Slici 1 prikazan je pločasti kondenzator, priključen na napon $U = 100 \text{ V}$. Rastojanje između ploča, između kojih je vazduh, iznosi $d = 20 \text{ mm}$. Izračunati i skicirati **vektor** električnog polja između ploča kondenzatora. Ako se između ploča postavi veoma mala kuglica, naelektrisana sa $Q = -10 \mu\text{C}$, izračunati i skicirati **vektor** sile koja deluje na kuglicu. (7 poena)

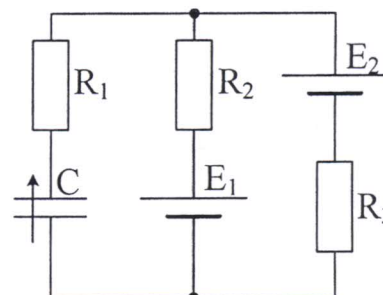


Slika 1

2. U kolu na Slici 2 poznato je: $R_1 = 10 \Omega$, $R_2 = 4 \Omega$, $R_3 = 20 \Omega$, $E_1 = 3 \text{ V}$, $E_2 = 15 \text{ V}$, $C = 20 \text{ nF}$.

a) Odrediti količinu nalektisanja kondenzatora u naznačenom smeru i elektrostatičku energiju kondenzatora. (4 poena)

b) Odrediti snagu otpornika R_2 i snagu naponskog generatora E_1 . (4 poena)

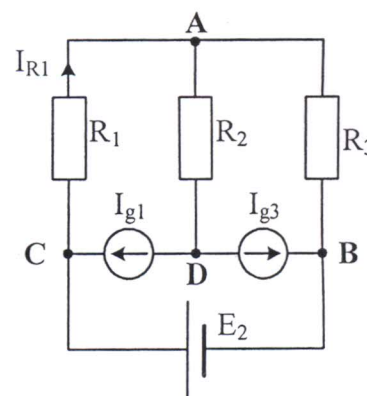


Slika 2

3. U kolu na Slici 3 poznato je: $R_1 = R_2 = R_3 = R = 10 \Omega$, $I_{g1} = 1 \text{ A}$, $E_2 = 70 \text{ V}$, $I_{g3} = 3 \text{ A}$.

a) Primenom metode superpozicije odrediti napon U_{AB} . (12 poena)

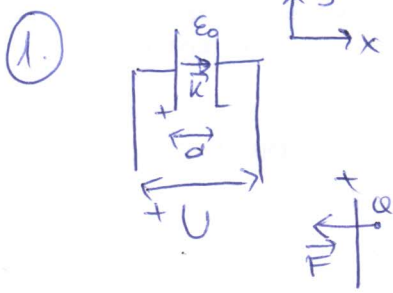
b) Primenom Tevenenove teoreme odrediti intenzitet struje I_{R1} kroz otpornik R_1 . (13 poena)



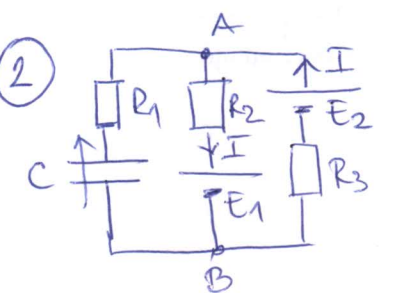
Slika 3

Izrada kolokvijuma traje 75 minuta. Na vežbanci napisati broj grupe zadatka. Papir sa tekstom zadatka predaje se u vežbanci tj. ne sme se izneti.

I ПРЯМА

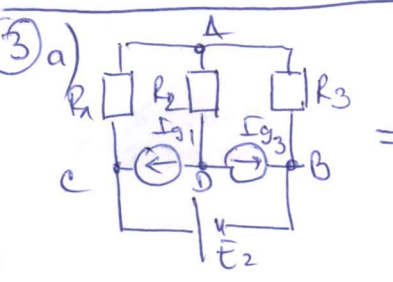


a) $\vec{K} = \frac{\sigma}{\epsilon_0} \vec{e} = \frac{Q}{\epsilon_0 S} \vec{e} = \frac{U}{d} \vec{e} = \frac{100V}{20 \cdot 10^{-3}m} \vec{e} = 5 \frac{kV}{m} \vec{e}$
 b) $\vec{F} = q \cdot \vec{K} = -10 \mu C \cdot 5 \frac{kV}{m} \vec{e} = -50 \mu N \vec{e}$



a) $I = \frac{E_2 - E_1}{R_2 + R_3} = \frac{15 - 3}{24} = \frac{12}{24} = \frac{1}{2} A$
 $U_C = U_{BA} = -E_2 + R_3 I = -15 + 20 \cdot \frac{1}{2} = -5V$
 $Q_C = U_C \cdot C = -100 \mu C$
 $W_C = \frac{1}{2} Q_C U_C = 250 \mu J$

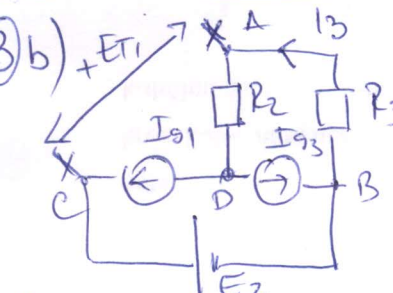
b) $P_{R_2} = R_2 I^2 = 4 \cdot \frac{1}{4} = 1W$
 $P_{E_1} = E_1 \cdot (-I) = 3 \cdot \frac{1}{2} = -1.5W$



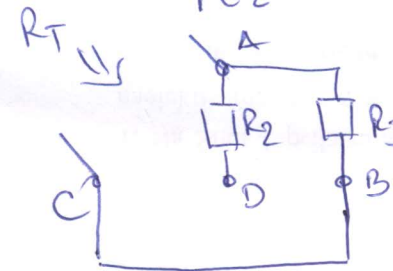
Three sub-circuits are shown to find \$U_{AB}\$:

- Sub-circuit 1: $I_3^I = \frac{-R_1 I_{g1}}{R_1 + R_3}$, $U_{AB}^I = R_3 I_3^I = -\frac{R_1 R_3 I_{g1}}{R_1 + R_3}$
- Sub-circuit 2: $I_3^{II} = \frac{E_2}{R_1 + R_3}$, $U_{AB}^{II} = R_3 I_3^{II} = \frac{R_3}{R_1 + R_3} E_2$
- Sub-circuit 3: $I_3^{III} = \frac{R_1 I_{g3}}{R_1 + R_3}$, $U_{AB}^{III} = R_3 I_3^{III} = -\frac{R_1 R_3 I_{g3}}{R_1 + R_3}$

Final result: $U_{AB} = U_{AB}^I + U_{AB}^{II} + U_{AB}^{III} = \frac{R_3}{R_1 + R_3} (E_2 - R_1 (I_{g1} + I_{g3})) = 15V = U_{AB}$



$E_T = U_{CA} = R_3 I_3 + E_2 = 40 + 70 = 110V$
 D: $I_3 = I_{g1} + I_{g3} = 4A$



$R_T = R_3 = 10 \Omega$
 $I_{R_1} = \frac{E_T}{R_1 + R_T}$
 $I_{R_1} = \frac{110}{20}$
 $I_{R_1} = 5.5A$