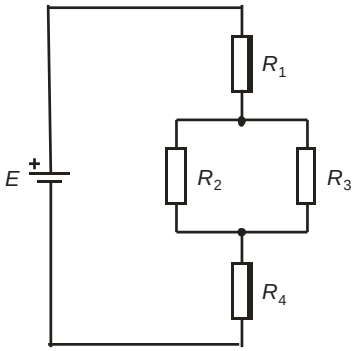
07.11.2005., Zagreb

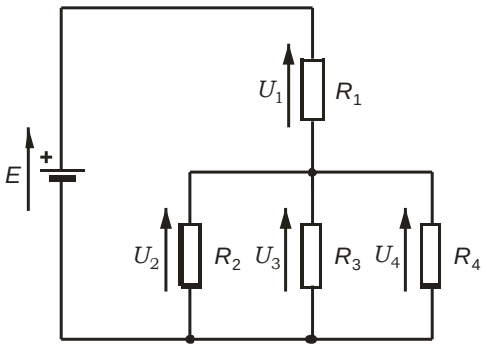
3. domaća zadaća iz Osnova elektrotehnike i elektronike

1. Odrediti struje i napone na otpornicima. Zadano je: E = 200 V, R_1 = 50 Ω, R_2 = 30 Ω, R_3 = 60 Ω, R_4 = 30 Ω.
2. U spoju na slici zadano je: R_1 = 10 Ω, R_2 = 20 Ω, R_3 = 30 Ω, R_4 = 12 Ω, I_3 = 2 A. Izračunajte E, I_1, I_2 i I_4.
3. U dijelu mreže prikazanom na slici poznato je: $R_2 = R_3$ = 5 Ω, I_A = 12 A, I_B = 4 A, I_1 = 2 A. Izračunajte I_C, I_2, I_3 i R_1.

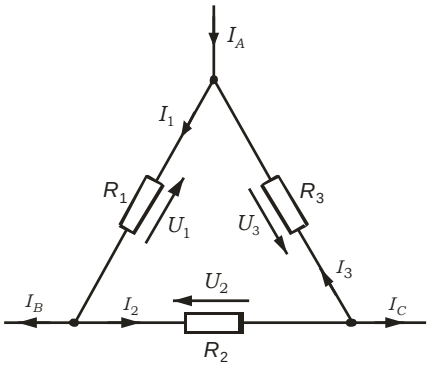
1.



2.



3.

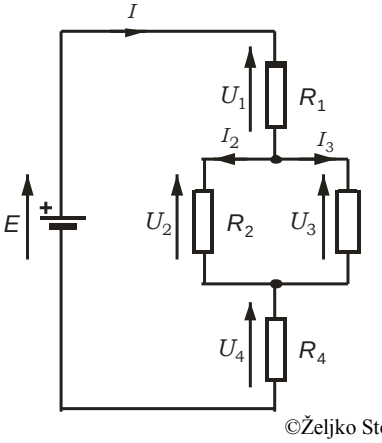


Rješenja

1. $R_{23} = \dfrac{R_2 \cdot R_3}{R_2 + R_3} = 20\ \Omega$

$R_{uk} = R_1 + R_{23} + R_4 = 100\ \Omega$

$\boxed{I = \dfrac{E}{R_{uk}} = 2\ A}$ $\qquad$ $\boxed{I_1 = I_4 = I_{23} = I}$



$$\boxed{U_1 = R_1 \cdot I_1 = 100\ V}$$

$$\boxed{U_2 = U_3 = U_{23} = R_{23} \cdot I_{23} = 40\ V}$$

$$\boxed{I_2 = \frac{U_2}{R_2} = 1{,}3\dot{3}\ A} \qquad \boxed{I_3 = \frac{U_3}{R_3} = 0{,}6\dot{6}\ A} \qquad \boxed{U_4 = R_4 \cdot I_4 = 60\ V}$$

Provjera za struje $I_1 = I_2 + I_3$ ... $2 = 1{,}3\dot{3} + 0{,}6\dot{6}$

Provjera za napone $E = U_1 + U_2 + U_4$ ... $200 = 100 + 40 + 60$

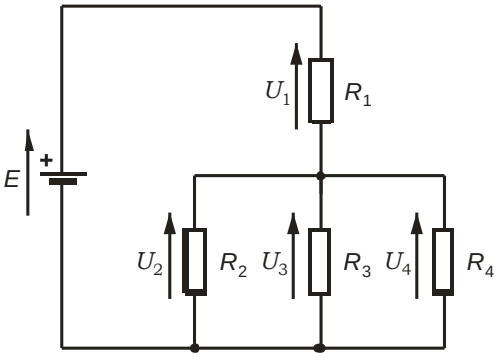
2. $U_3 = R_3 \cdot I_3 = 60\ V$

$U_2 = U_4 = U_3$

$$\boxed{I_2 = \frac{U_2}{R_2} = 3\ A} \qquad \boxed{I_4 = \frac{U_4}{R_4} = 5\,A} \qquad I_1 = I_2 + I_3 + I_4 = 10\ A$$

$U_1 = R_1 \cdot I_1 = 100\ V$

$\boxed{E = U_1 + U_2 = 160\ V}$



Provjera

$$R_{234} = R_2 \| R_3 \| R_4 = \frac{1}{\frac{1}{R_2} + \frac{1}{R_3} + \frac{1}{R_4}} = 6\ \Omega$$

$R_{uk} = R_1 + R_{234} = 16\ \Omega$

$$I_1 = \frac{E}{R_{uk}} = 10\ A$$

$$\left.\begin{aligned} \frac{U_1}{R_1} &= \frac{U_{234}}{R_{234}} \\ U &= U_1 + U_{234} \end{aligned}\right\} \qquad U_{234} = \frac{R_{234}}{R_1 + R_{234}} \cdot E = \frac{6}{16} \cdot 160 = 60\ V$$

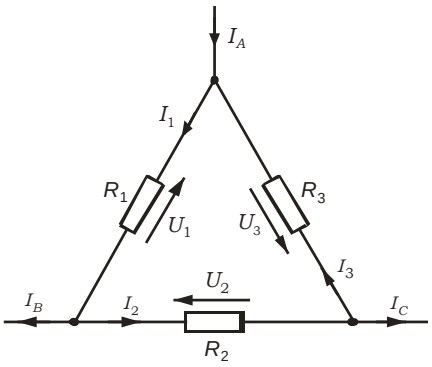
3. $\boxed{I_3 = I_1 - I_A = -10\ A}$

$U_3 = R_3 \cdot I_3 = -50\ V$

$I_A = I_B + I_C$ Cijeli trokut s otpornicima R_1, R_2, R_3 ponaša se kao čvor u kojeg ulaze ili iz njega izlaze struje I_A, I_B, I_C.

$$\boxed{I_C = I_A - I_B = 8\ A}$$

$$\boxed{I_2 = I_C + I_3 = -2\ A}$$



$$U_2 = R_2 \cdot I_2 = -10\ V$$

$$U_1 = -U_2 - U_3 = 60\ V$$

$$\boxed{R_1 = \frac{U_1}{I_1} = 30\ \Omega}$$

Provjera

$$I_1 = I_2 + I_B = -2 + 4 = 2\ A$$