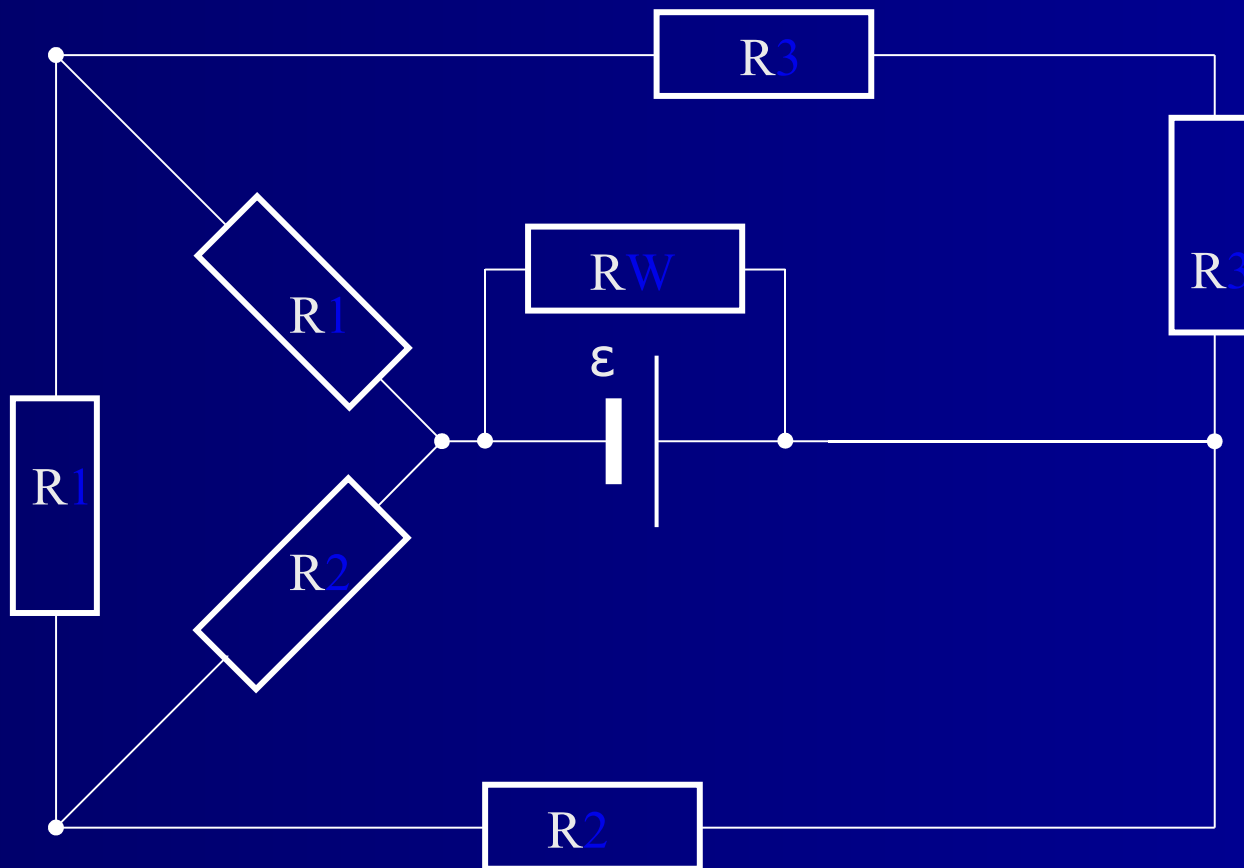


Ćwiczenie 9



Ćwiczenie 9

Dane obwodu:

$$R_1 = 6 \, [\Omega]$$

$$R_2 = 3 \, [\Omega]$$

$$R_3 = 4 \, [\Omega]$$

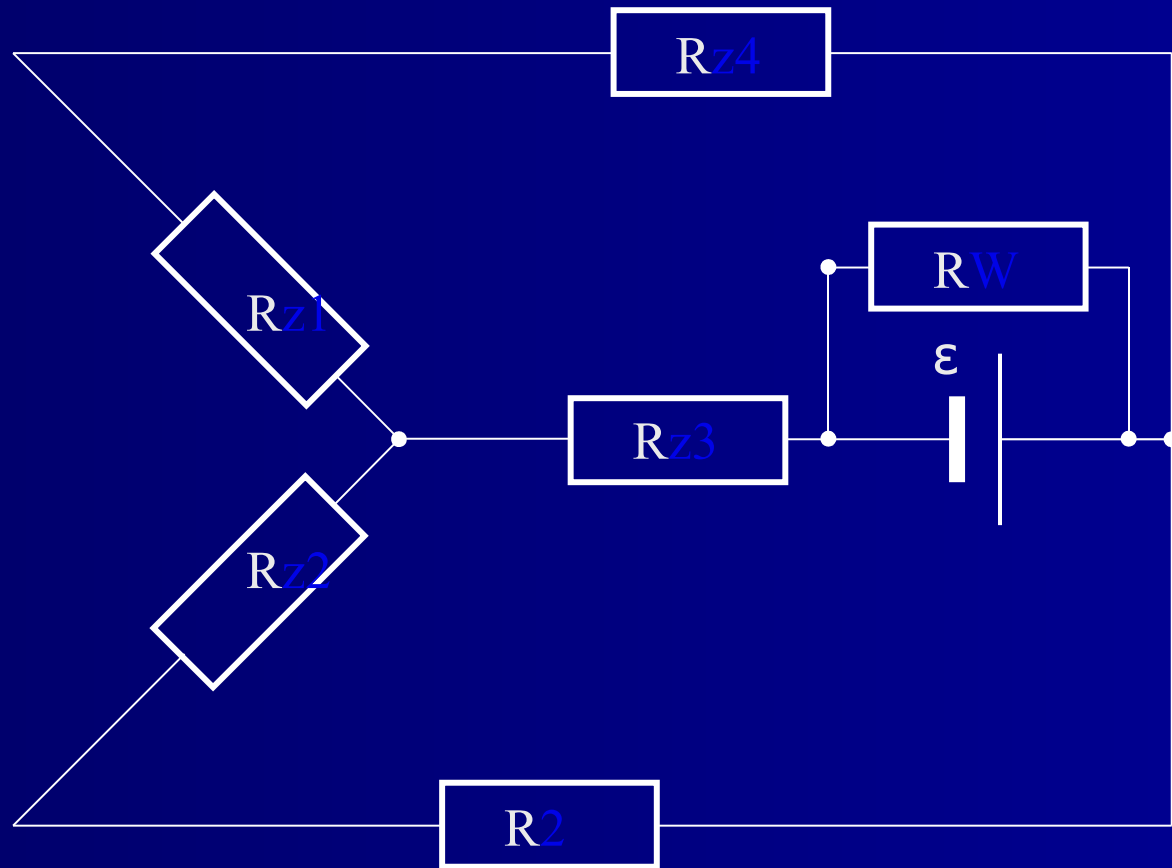
$$R_w = 2 \, [\Omega]$$

$$\varepsilon = 20 \, [V]$$

Oblicz prądy płynące w obwodzie

Oblicz napięcie na zaciskach ogniwa

Ćwiczenie 9



Ćwiczenie 9

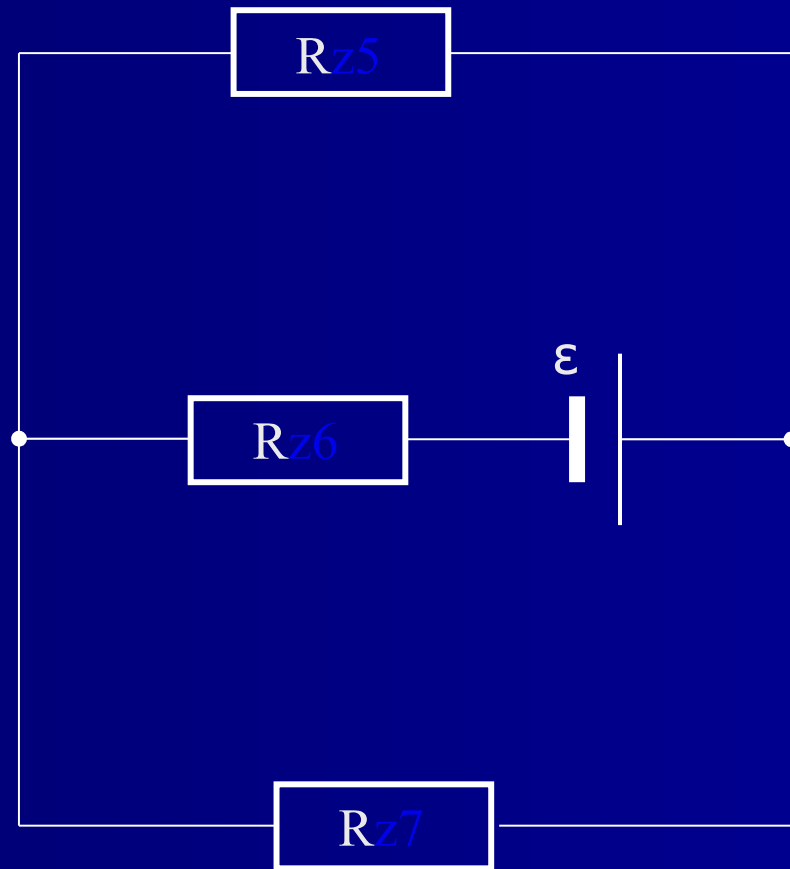
$$R_{z1} = \frac{R_1 \cdot R_1}{R_1 + R_2 + R_1} = \frac{6[\Omega] \cdot 6[\Omega]}{6[\Omega] + 3[\Omega] + 6[\Omega]} = 2,4[\Omega]$$

$$R_{z2} = \frac{R_1 \cdot R_2}{R_1 + R_2 + R_1} = \frac{6[\Omega] \cdot 3[\Omega]}{6[\Omega] + 3[\Omega] + 6[\Omega]} = 1,2[\Omega]$$

$$R_{z3} = \frac{R_2 \cdot R_1}{R_1 + R_2 + R_1} = \frac{3[\Omega] \cdot 6[\Omega]}{6[\Omega] + 3[\Omega] + 6[\Omega]} = 1,2[\Omega]$$

$$R_{z4} = R_3 + R_3 = 4[\Omega] + 4[\Omega] = 8[\Omega]$$

Ćwiczenie 9



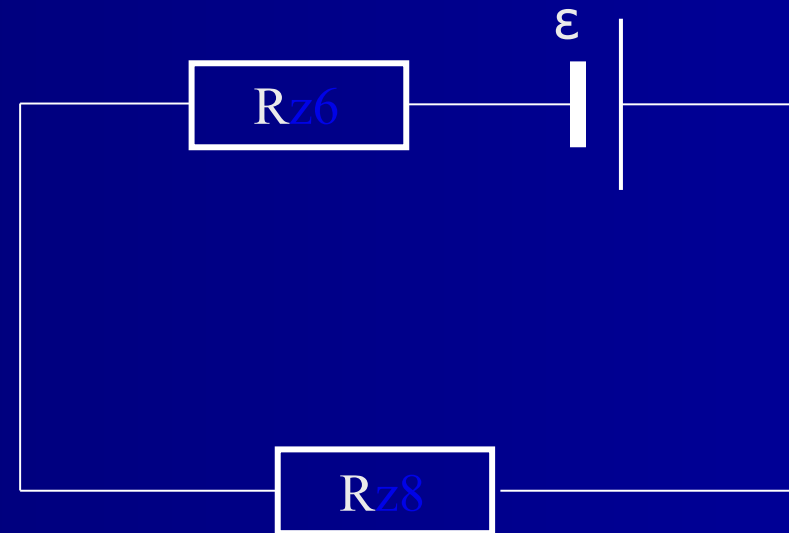
Ćwiczenie 9

$$R_{z5} = R_{z1} + R_{z4} = 2,4[\Omega] + 8[\Omega] = 10,4[\Omega]$$

$$R_{z6} = R_{z3} + R_W = 1,2[\Omega] + 2[\Omega] = 3,2[\Omega]$$

$$R_{z7} = R_{z2} + R_2 = 1,2[\Omega] + 3[\Omega] = 4,2[\Omega]$$

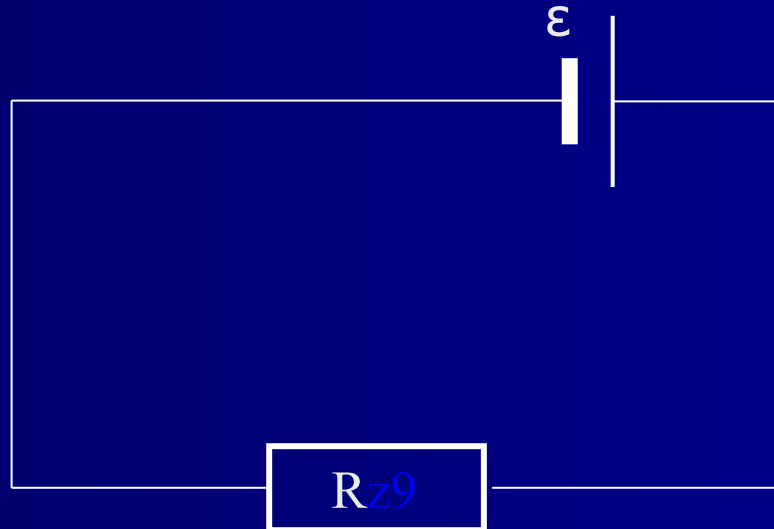
Ćwiczenie 9



$$\frac{1}{R_{z8}} = \frac{1}{R_{z5}} + \frac{1}{R_{z7}}$$

$$R_{z8} = \frac{R_{z5} \cdot R_{z7}}{R_{z5} + R_{z7}} = \frac{10,4[\Omega] \cdot 4,2[\Omega]}{10,4[\Omega] + 4,2[\Omega]} = 2,99[\Omega]$$

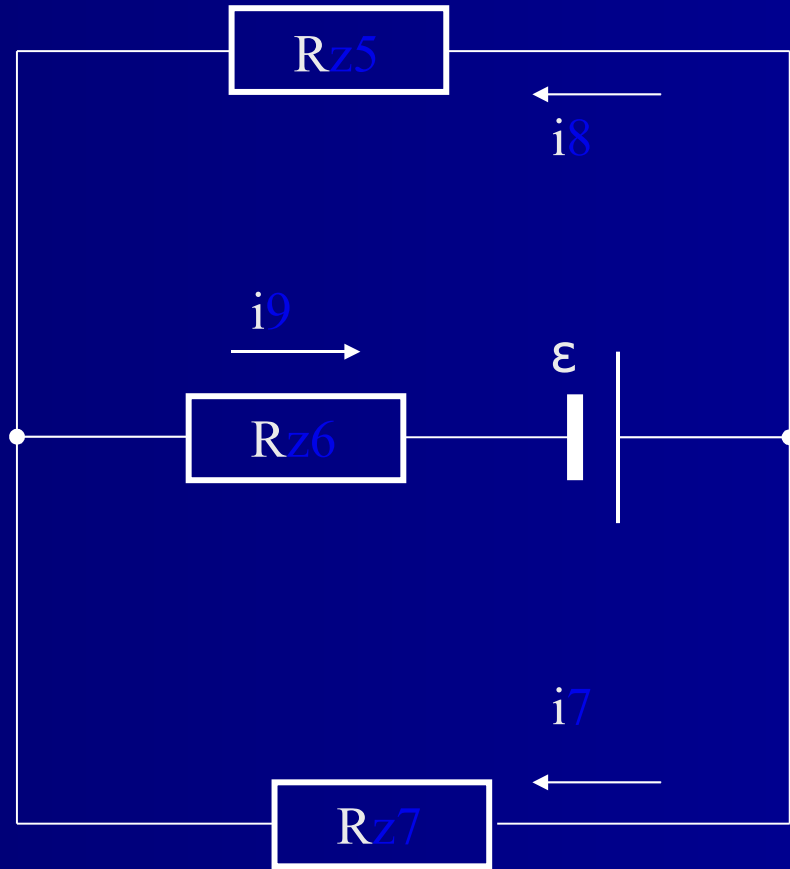
Ćwiczenie 9



$$R_{z9} = R_{z6} + R_{z8} = 3,2[\Omega] + 2,99[\Omega] = 6,19[\Omega]$$

$$i_9 = \frac{\varepsilon}{R_{z9}} = \frac{20[V]}{6,19[\Omega]} = 3,23[A]$$

Ćwiczenie 9



Ćwiczenie 9

$$i_9 = i_8 + i_7 \quad i_8 = i_9 - i_7$$

$$i_8 \cdot R_{z5} = i_7 \cdot R_{z7}$$

$$i_9 \cdot R_{z5} - i_7 \cdot R_{z5} = i_7 \cdot R_{z7}$$

$$i_7 \cdot (R_{z5} + R_{z7}) = i_9 \cdot R_{z5}$$

$$i_7 = i_9 \cdot \frac{R_{z5}}{R_{z5} + R_{z7}}$$

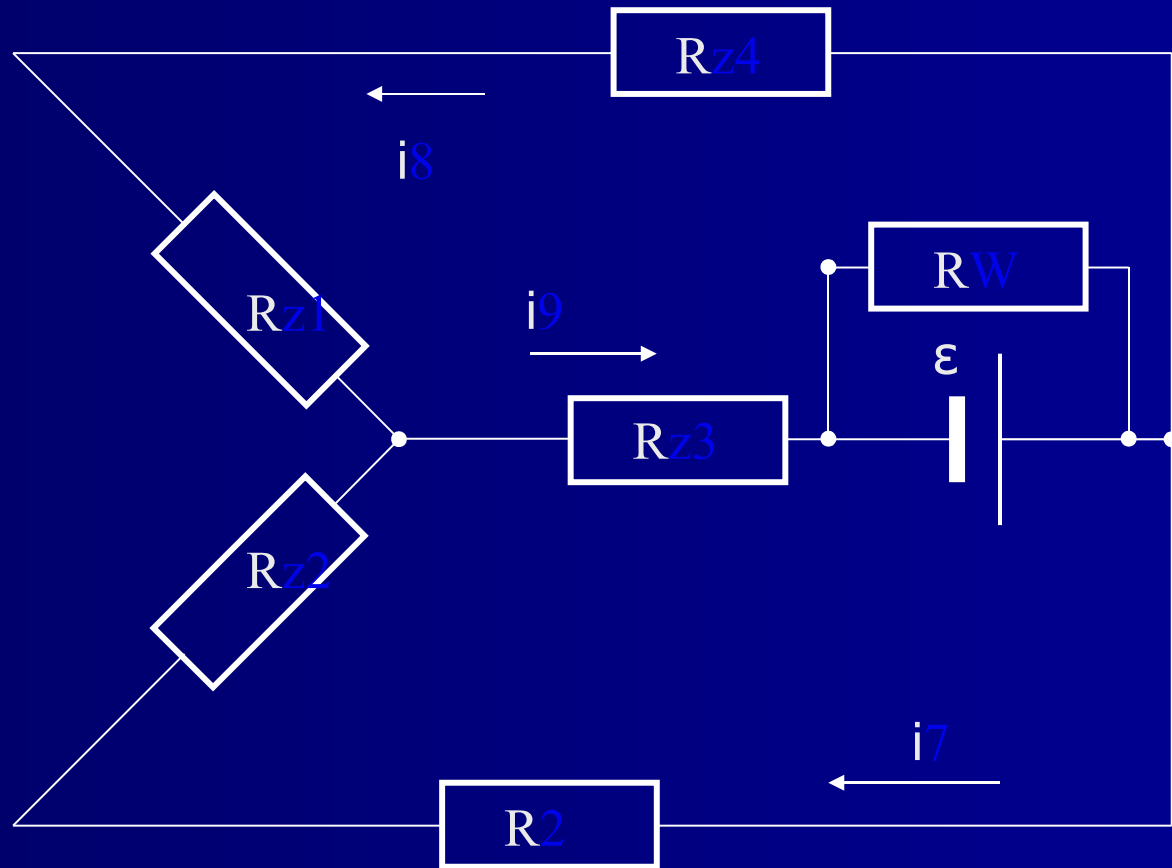
Ćwiczenie 9

$$i_7 = i_9 \cdot \frac{R_{z5}}{R_{z5} + R_{z7}} = 3,23[A] \cdot \frac{10,4[\Omega]}{10,4[\Omega] + 4,2[\Omega]}$$

$$i_7 = 2,3[A]$$

$$i_8 = 3,23[A] - 2,3[A] = 0,93[A]$$

Ćwiczenie 9



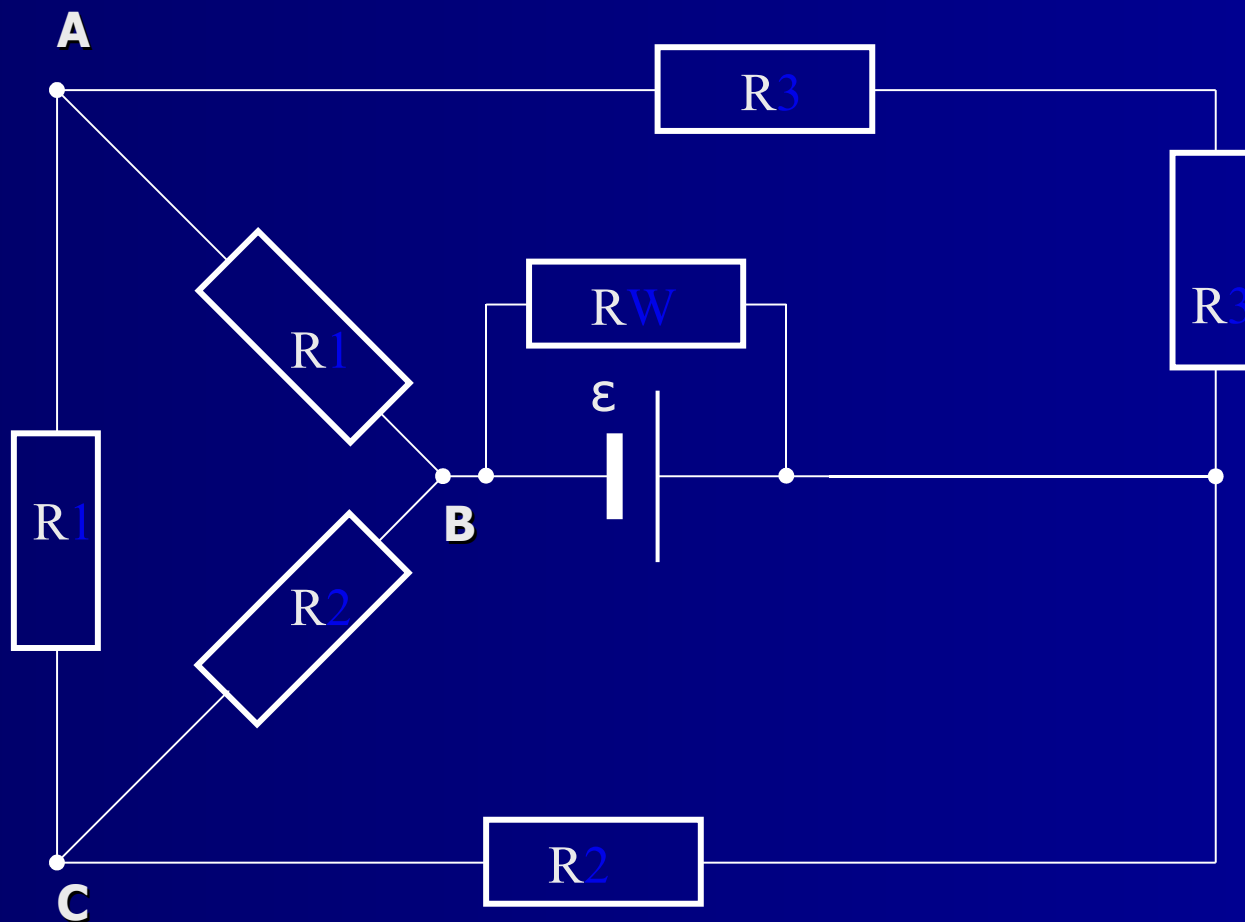
Ćwiczenie 9

$$U_{z2} = i_7 \cdot R_{z2} = 2,3[A] \cdot 1,2[\Omega] = 2,76[V]$$

$$U_{z3} = i_9 \cdot R_{z3} = 3,23[A] \cdot 1,2[\Omega] = 3,88[V]$$

$$U_{z1} = i_8 \cdot R_{z1} = 0,93[A] \cdot 2,4[\Omega] = 2,23[V]$$

Ćwiczenie 9



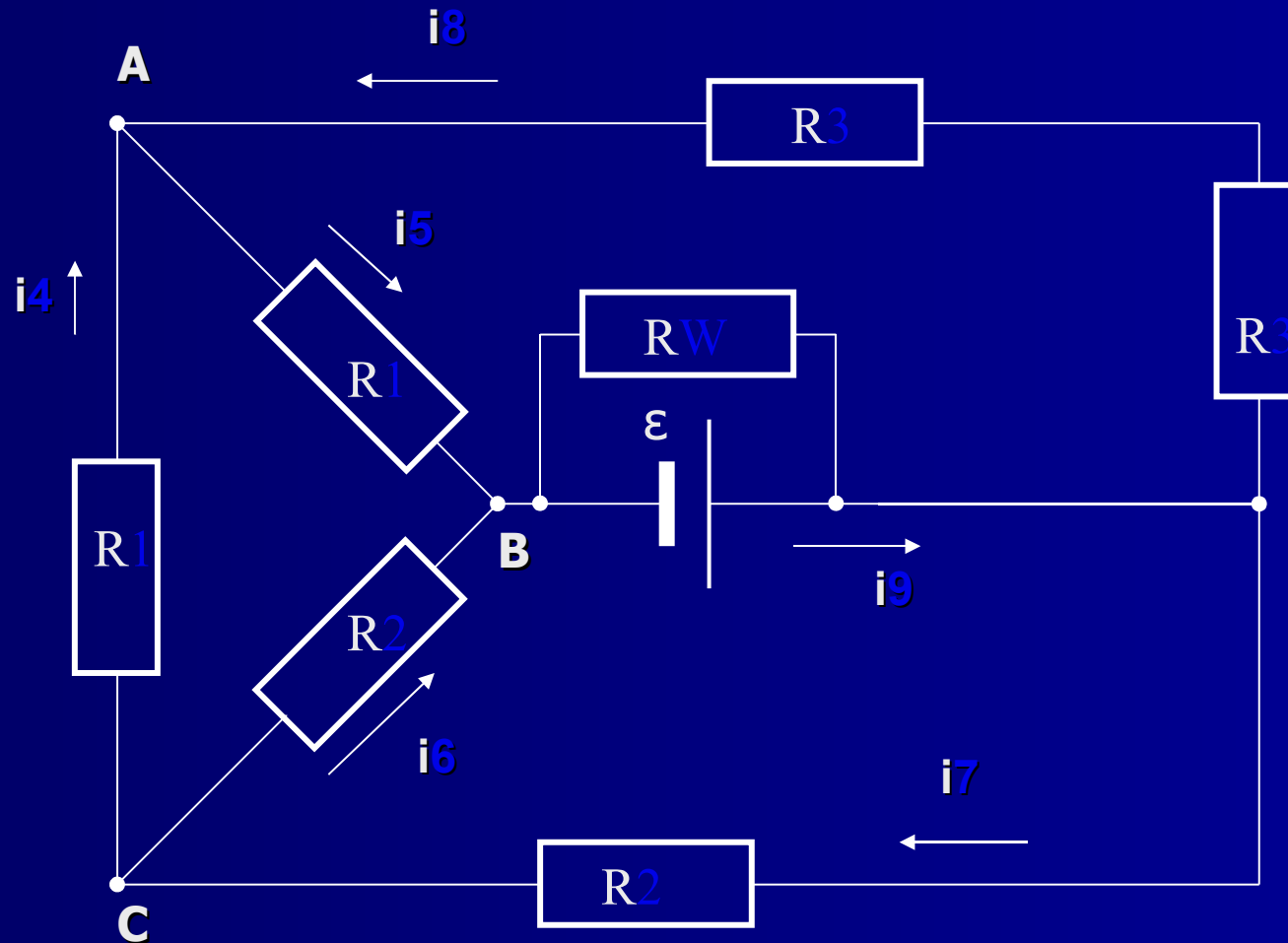
Ćwiczenie 9

$$U_{AB} = U_{z1} + U_{z3} = 2,23[V] + 3,88[V] = 6,11[V]$$

$$U_{BC} = U_{z3} + U_{z2} = 3,88[V] + 2,76[V] = 6,64[V]$$

$$U_{CA} = U_{z2} - U_{z1} = 2,76[V] - 2,23[V] = 0,53[V]$$

Ćwiczenie 9



Ćwiczenie 9

$$i_5 = \frac{U_{AB}}{R_1} = \frac{6,11[V]}{6[\Omega]} = 1,02[A]$$

$$i_6 = \frac{U_{BC}}{R_2} = \frac{6,64[V]}{3[\Omega]} = 2,21[A]$$

$$i_4 = \frac{U_{AC}}{R_1} = \frac{0,53[V]}{6[\Omega]} = 0,09[A]$$

Ćwiczenie 9

$$i_5 + i_6 = i_9$$

$$1,02[A] + 2,21[A] = 3,23[A]$$

$$i_7 + i_8 = i_9$$

$$2,3[A] + 0,93[A] = 3,23[A]$$

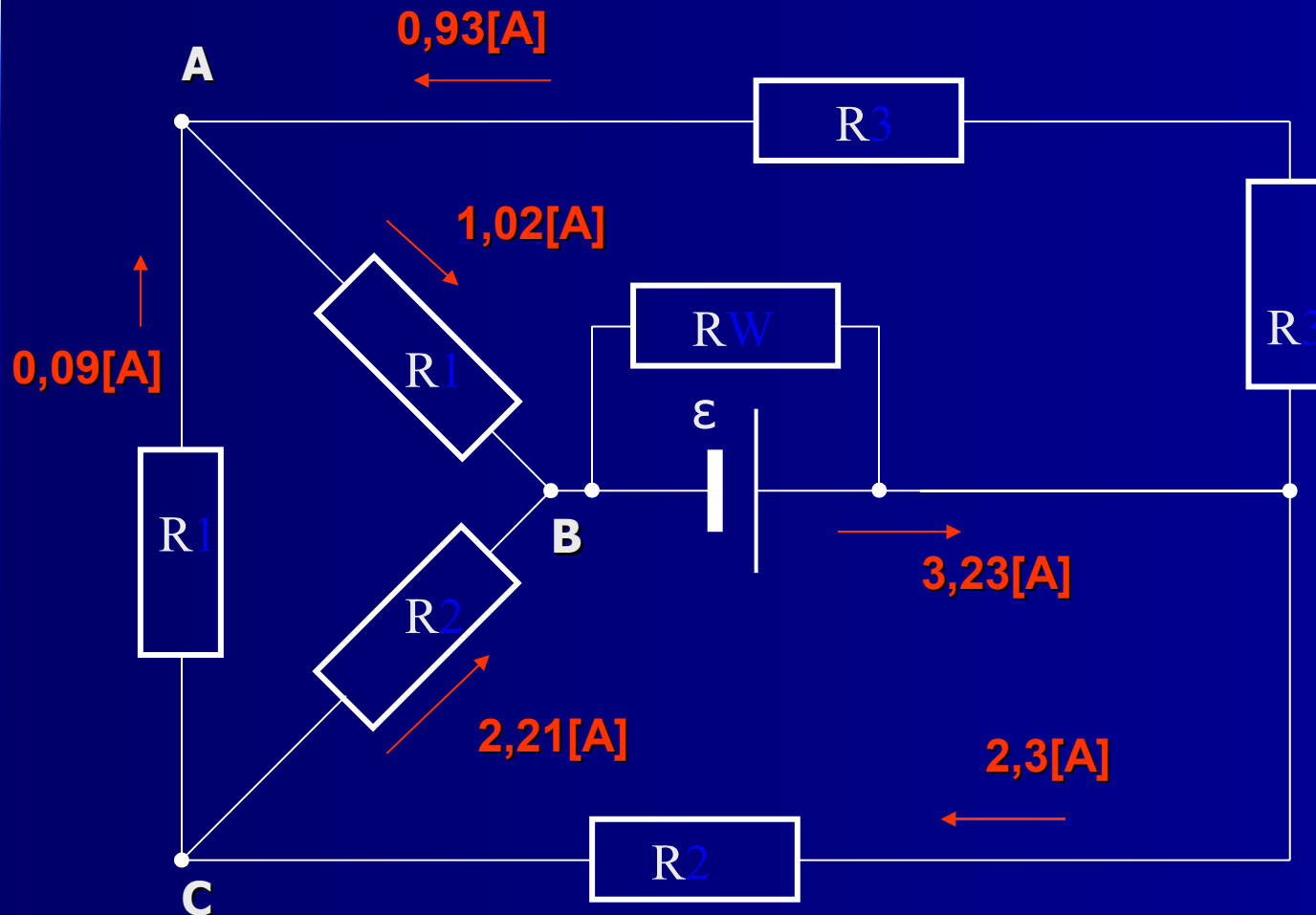
$$i_8 + i_4 = i_5$$

$$0,93[A] + 0,09[A] = 1,02[A]$$

$$i_6 + i_4 = i_7$$

$$2,21[A] + 0,09[A] = 2,3[A]$$

Ćwiczenie 9



Ćwiczenie 9

$$U_z = \varepsilon - i \cdot R_w$$

$$U_z = 20[V] - 3,23[V] \cdot 2[\Omega]$$

$$U_z = 13,54[V]$$