

# 1 První příklad zadání C

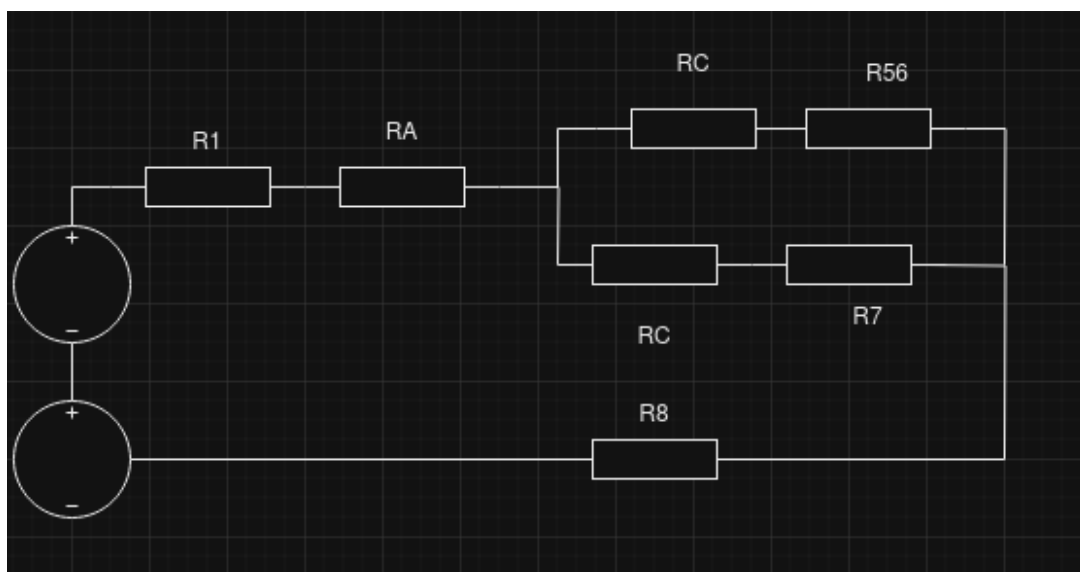


Figure 1: Úprava pomocí hvězdy

$$R_{56} = \frac{R_6 \times R_5}{R_6 + R_5}$$

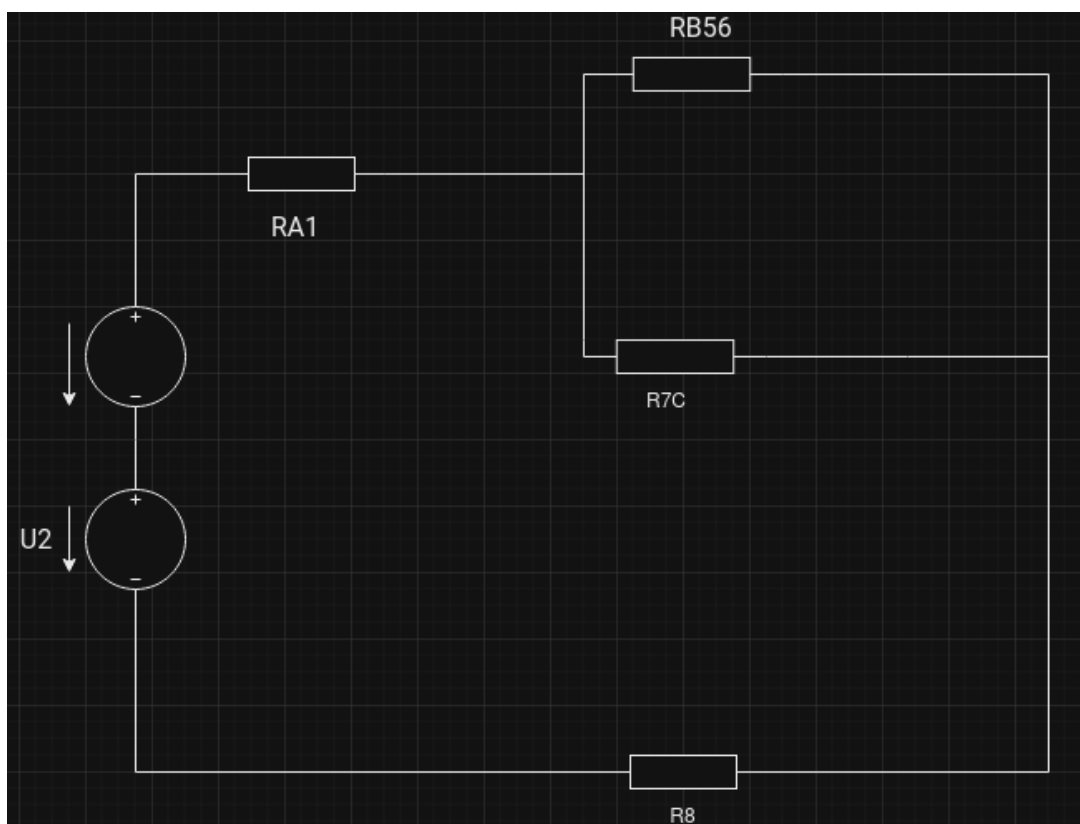


Figure 2: Další úprava

$$R_{A1} = \frac{R_2 \times R_3}{R_2 + R_3 + R_4} + R_1$$

$$R_{A1} = \frac{810 \times 220}{810 + 220 + 190} + 450 \Rightarrow R_{41} = 596.0656$$

$$R_{B56} = \frac{R_2 \times R_4}{R_2 + R_3 + R_4} + \frac{R_6 \times R_5}{R_6 + R_5}$$

$$R_{B56} = \frac{810 \times 220}{810 + 190 + 720} + \frac{220 \times 720}{220 + 720} = 272.1153$$

$$R_{C7} = \frac{R_3 \times R_4}{R_2 + R_3 + R_4} + R_7$$

$$R_{C7} = \frac{190 \times 220}{810 + 190 + 720} + 260 = 284.3023$$

$$R = \frac{272.1153 \times 284.3032}{272.1153 + 284.3023} + 596.0656 + 180 \Rightarrow R = 915.1037$$

$$I = \frac{U}{R} = \frac{180}{915.1037} \Rightarrow I = 0.1967$$

$$U_{R3} = U - U_{R7} - U_{R1} - U_{R8}$$

$$U_{R7} = R_7 \times I$$

$$U_{R1} = R_1 \times I$$

$$U_{R7} = 260 \times 0.1967 = 51.114 \text{ V}$$

$$U_{R1} = 450 \times 0.1967 = 88.515 \text{ V}$$

$$U_{R3} = 180 - 51.114 - 88.515 - 35.406 = 4.965 \text{ V}$$

$$I_{R3} = \frac{U_{R3}}{R_3}$$

$$I_{R3} = \frac{4.965}{190} = 0.0261 \text{ A}$$

## 2 Resení druhého príkladu

$$\text{Uzel A: } \frac{130 - U_A}{47} + \frac{U_A - U_B}{28} - \frac{90 - (U_A - U_B)}{58} - \frac{U_A}{39} = 0$$

$$\text{Uzel B: } \frac{5}{10} + \frac{90 - (U_A - U_B)}{58} - \frac{U_A - U_B}{28} - \frac{U_C - U_B}{35} = 0$$

$$\text{Uzel C: } \frac{U_C - U_B}{35} - \frac{5}{10} - \frac{U_C}{25} = 0$$

$$8987U_A - 78819U_B = -1807260$$

$$-215U_A + 331U_B - 116U_C = -8330$$

$$-10U_B - 4U_C = 175$$

Pomoci Cramerovy metody vyresime  $U_A$

$$U_A = 191.716 \text{ V}$$

$$U_{R2} = U_A \Rightarrow U_{R2} = 191.716 \text{ V}$$

$$I_{R2} = \frac{U_{R2}}{39} \Rightarrow I_{R2} = 4.915 \text{ A}$$

## 3 Řešení třetího příkladu

Úprava:

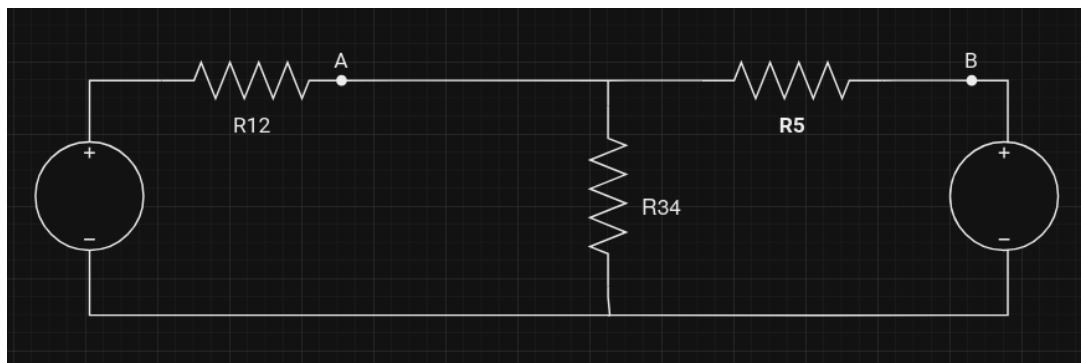


Figure 3: Další úprava

$$R_i = \frac{R_{12} \times R_5}{R_{12} + R_5}$$

$$R_i = \frac{950 \times 80}{950 + 80} \Rightarrow R_i = 73.786$$

$$I_x = \frac{U_2 - U_1}{R_{12} + R_5}$$

$$I_x = \frac{180 - 130}{950 + 80} \Rightarrow I_x = 0.049$$

$$U_i = U_1 + R_i \times I_x$$

$$U_i = 130 + 950 \times 0.049$$

$$I_{R34} = \frac{U_i}{R_i + R_{34}}$$

$$\frac{176.55}{73.786 + 150} \Rightarrow I_{R34} = 0.789$$

$$U_{R34} = 0.789 \times 150 \Rightarrow U_{R34} = 118.35 \text{ V}$$

$$U_{R3} = 118.35 \text{ V}$$

$$I_{R3} = \frac{118.35}{195} \Rightarrow I_{R3} = 0.606 \text{ A}$$

## 4 Resení Pateho prikladu

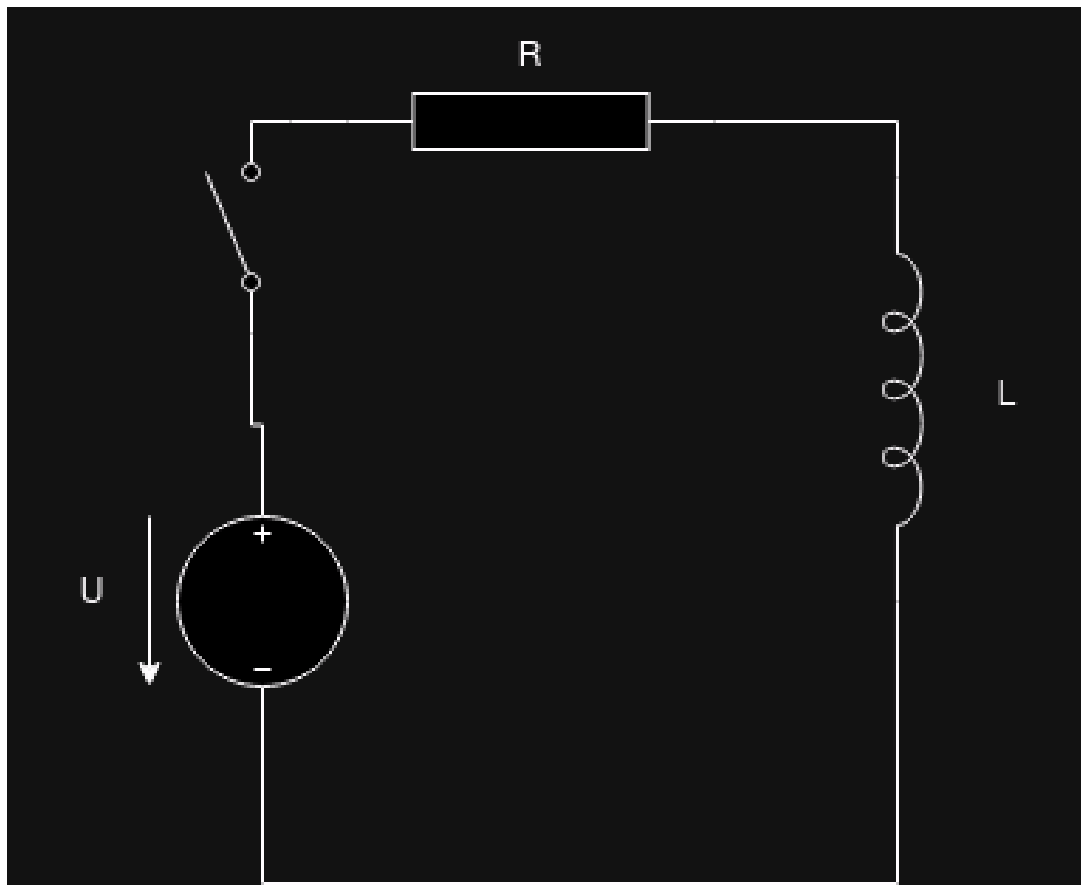


Figure 4: Paty priklad

**Z ceho budeme vychaze**

$$i = \frac{U_r}{R} \Rightarrow \text{Ohmův zákon}$$

$$U_r + U_r = U \Rightarrow \text{Kirchhoffův druhý zákon}$$

$$i' = \frac{U_c}{L}, \quad i(0) = i_{L_0}$$

**Samotny vypocet**

**Kroky:** 1. Nejprve vyjádříme  $U_r$  z první rovnice. 2. Dosadíme  $U_r$  do druhé rovnice. 3. Poté dosadíme výsledek do třetí rovnice.

$$i' = \frac{U}{L} - \frac{R}{L} \times i$$

**Úprava:**

$$L \times i' + R \times i = U$$

**Charakteristická rovnice:**

$$L\lambda + R = 0 \Rightarrow \lambda = \frac{-R}{L}$$

**Očekávané řešení:**

$$i(t) = I_L e^{\lambda t} \Rightarrow I_L(t) = I_L e^{\frac{-R}{L}t}$$

**Dosadíme do upravené rovnice:**

$$I_L'(t) = \frac{U}{L} e^{\frac{R}{L}t}$$

**Jelikož se jedná o derivaci, musíme integrovat:**

$$\frac{U}{L} \int e^{\frac{R}{L}t} dt$$

**Substituce:**  $u = \frac{R}{L}t \Rightarrow du = \frac{R}{L} dt$

$$\frac{du}{dt} = \frac{R}{L}, \quad \text{takže} \quad dt = \frac{L}{R} du$$

$$\frac{U}{L} \int e^u \times \frac{L}{R} du$$

**Zjednodušení:**

$$\frac{U}{L} \times \frac{L}{R} \int e^u du$$

$$\frac{U}{R} e^u + C$$

**Dosadíme zpět:**

$$I_L = \frac{U}{R} + i(0) e^{\frac{R}{L} \times t}$$

$$i(0) =_{LP} \rightarrow 8 - \frac{U}{R} = i(0)$$

$$I_L = \frac{U}{R} + \left(8 - \frac{U}{R}\right) \times e^{\frac{R}{L}t}$$

$$I_L = \frac{1}{2} + \frac{15}{2} \times e^{-5 \times t}$$