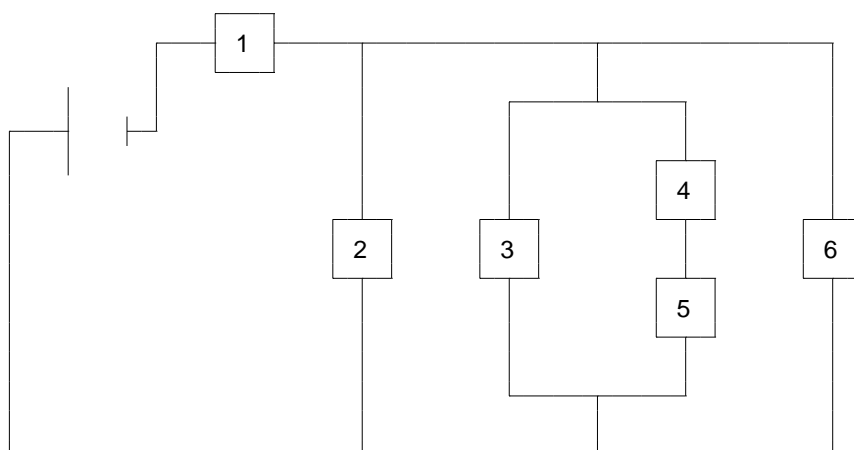


## 0.1 5. Hausaufgabe

### 0.1.1 Analyse eines verzweigten Stromkreises



#### Gegeben

$R_1$  bis  $R_5$  betragen  $10,0\ \Omega$ ,  $R_6$  sei variabel.

$$U = 9,00\ \text{V};$$

#### Gesucht

$$R(R_6), I(R_6),$$

$$I_6(R_6), P_6(R_6)$$

#### Rechnung

$$R_{4,5} = R_4 + R_5 = 2R_1;$$

$$R_{3,4,5} = \frac{1}{\frac{1}{R_1} + \frac{1}{R_{4,5}}} = \frac{2}{3}R_1;$$

$$R_{2,3,4,5,6} = \frac{1}{\frac{1}{R_2} + \frac{1}{R_{3,4,5}} + \frac{1}{R_6}} = \frac{1}{\frac{1}{R_6} + \frac{5}{2R_1}};$$

$$R(R_6) = R = R_1 + R_{2,3,4,5,6} = R_1 + \frac{1}{\frac{1}{R_6} + \frac{5}{2R_1}} = 10,0\ \Omega + \frac{1}{\frac{1}{R_6} + 0,250\frac{1}{\Omega}};$$

$$I(R_6) = I = \frac{U}{R} = \frac{U}{R_1 + \frac{1}{\frac{1}{R_6} + \frac{5}{2R_1}}} = \frac{9,00\ \text{V}}{10,0\ \Omega + \frac{1}{\frac{1}{R_6} + 0,250\frac{1}{\Omega}}};$$

$$U_6(R_6) = U_6 = U_2 = \frac{R_{2,3,4,5,6}}{R_1} U_1 = \frac{R_{2,3,4,5,6}}{R_1} R_1 I_1 = R_{2,3,4,5,6} I = \frac{I}{\frac{1}{R_6} + \frac{5}{2R_1}} = \frac{U}{9,00 \text{ V}} = \frac{U}{\left(R_1 + \frac{1}{\frac{1}{R_6} + \frac{5}{2R_1}}\right) \left(\frac{1}{R_6} + \frac{5}{2R_1}\right)} = \frac{U}{\left(10,0 \Omega + \frac{1}{\frac{1}{R_6} + 0,250 \frac{1}{\Omega}}\right) \left(\frac{1}{R_6} + 0,250 \frac{1}{\Omega}\right)};$$

$$I_6(R_6) = I_6 = \frac{U_6}{R_6} = \frac{U}{\left(R_1 + \frac{1}{\frac{1}{R_6} + \frac{5}{2R_1}}\right) \left(\frac{1}{R_6} + \frac{5}{2R_1}\right) R_6} = \frac{9,00 \text{ V}}{\left(10,0 \Omega + \frac{1}{\frac{1}{R_6} + 0,250 \frac{1}{\Omega}}\right) \left(\frac{1}{R_6} + 0,250 \frac{1}{\Omega}\right) R_6};$$

$$P_6(R_6) = P_6 = U_6 I_6 = \frac{U^2}{\left(R_1 + \frac{1}{\frac{1}{R_6} + \frac{5}{2R_1}}\right)^2 \left(\frac{1}{R_6} + \frac{5}{2R_1}\right)^2 R_6} = \frac{81,0 \text{ V}^2}{\left(10,0 \Omega + \frac{1}{\frac{1}{R_6} + 0,250 \frac{1}{\Omega}}\right)^2 \left(\frac{1}{R_6} + 0,250 \frac{1}{\Omega}\right)^2 R_6};$$

### Grenzwertbetrachtungen

$$\lim_{R_6 \rightarrow 0 \Omega} R(R_6) = 10,0 \Omega;$$

$$\lim_{R_6 \rightarrow \infty \Omega} R(R_6) = 14,0 \Omega;$$

$$\lim_{R_6 \rightarrow 0 \Omega} I(R_6) = 0,900 \text{ A};$$

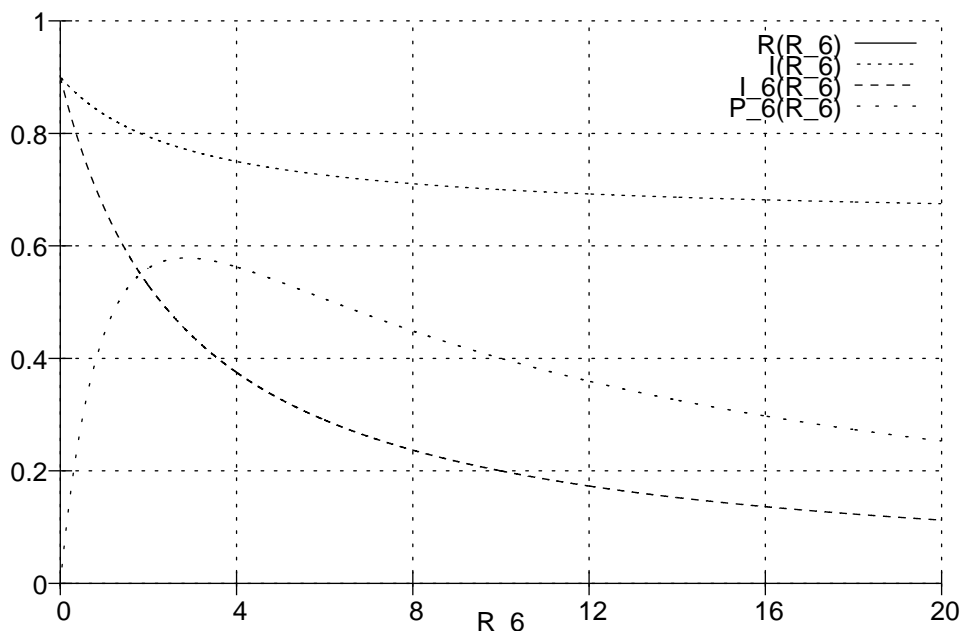
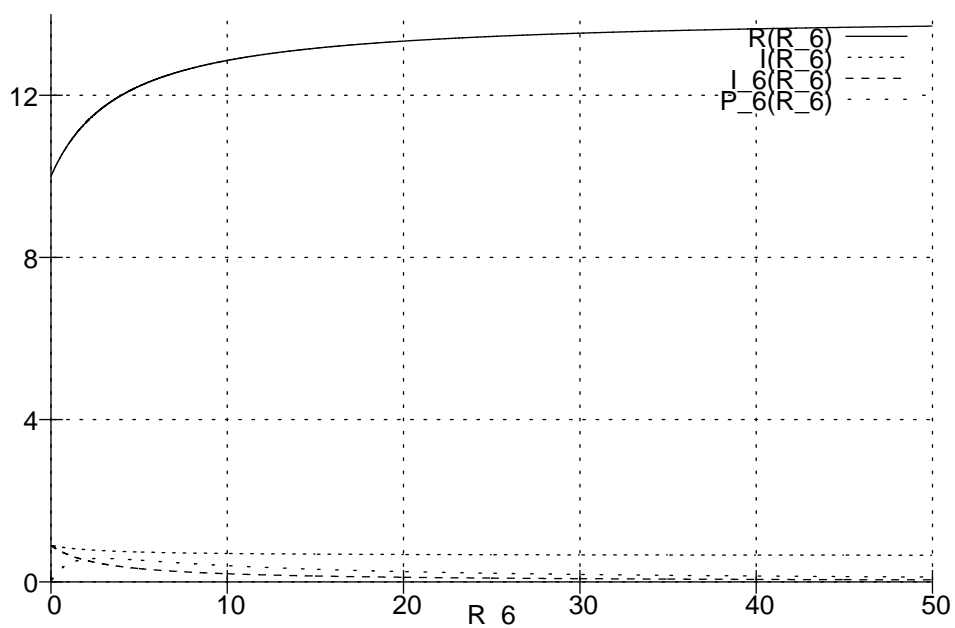
$$\lim_{R_6 \rightarrow \infty \Omega} I(R_6) = 0,643 \text{ A};$$

$$\lim_{R_6 \rightarrow 0 \Omega} I_6(R_6) = 0,900 \text{ A};$$

$$\lim_{R_6 \rightarrow \infty \Omega} I_6(R_6) = 0 \text{ A};$$

$$\lim_{R_6 \rightarrow 0 \Omega} P_6(R_6) = 0 \text{ W};$$

$$\lim_{R_6 \rightarrow \infty \Omega} P_6(R_6) = 0 \text{ W};$$



(Benötigte Zeit: 78 min (inkl. Eintippen, Grafik und Formatierung;  
reine Arbeitszeit 44 min))