

A1: Lös:

a) $R_2 = 100 \Omega$ $R_{12} = 250 \Omega$ $R_{34} = 149,86 \Omega$ $R_{ges} = 93,69 \Omega$
 $U_{ges} = 50 \text{ V}$ $U_{R1} = 30 \text{ V}$
 $I_2 = 333,7 \text{ mA}$ $I_3 = 227,3 \text{ mA}$ $I_4 = 106,4 \text{ mA}$ $I_{ges} = 533,7 \text{ mA}$

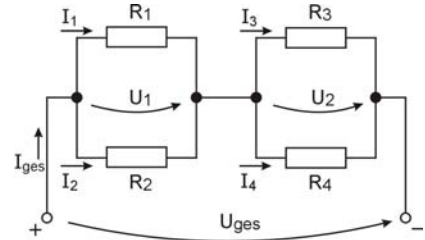
b) $U_{ges} = I_{ges} \cdot R_{ges} \rightarrow |20^\circ\text{C} \quad |100^\circ\text{C}$
 $R_{ges100} = R_{ges20} (1 + \alpha_{20} \Delta\vartheta)$

$$\frac{I_{ges100}}{I_{ges20}} = \frac{R_{ges20}}{R_{ges100}} = F = 1 / (1 + \alpha_{20} \Delta\vartheta) = 0,969$$

$I_{ges100} = I_{ges20} - 3,1\% \rightarrow$ Alle Ströme sind bei 100°C um $3,1\%$ kleiner als bei 20°C Umgebungstemperatur!

A2: Lös:

$U_1 = U_{R1} = U_{R2} = 3,7 \text{ V}$
 $R_{12} = 2,555 \text{ k}\Omega$, $R_{34} = 720 \Omega$, $R_{ges} = 3275 \Omega$
 $U_2 = U_{R3} = U_{R4} = 1,043 \text{ V}$
 $U_{ges} = 4,743 \text{ V}$
 $I_1 = 661 \mu\text{A}$ $I_2 = 787 \mu\text{A}$
 $I_3 = 869 \mu\text{A}$ $I_4 = 579 \mu\text{A}$
 $I_{ges} = 1,448 \text{ mA}$



A3: Lös:

$U_1 = 19,49 \text{ V}$ $I_4 = 51,2 \text{ mA}$ $U_2 = 4,51 \text{ V}$ $I_3 = 25,1 \text{ mA}$
 $I_2 = 9,7 \text{ mA}$ $R_{ges} = 480 \Omega$ $R_2 = 464 \Omega$

A4: Lös:

$R_{ges} = 1231 \Omega$ $U_5 = U_6 = 2 \text{ V}$ $I_6 = 1 \text{ mA}$ $I_3 = 2 \text{ mA}$
 $U_3 = 4 \text{ V}$ $U_2 = 6 \text{ V}$ $I_2 = 3 \text{ mA}$ $I_4 = 5 \text{ mA}$
 $U_4 = 10 \text{ V}$ $U_1 = U_{ges} = 16 \text{ V}$ $I_1 = 8 \text{ mA}$ $I_{ges} = 13 \text{ mA}$

A5: Lös:

$R_{ges} = 5250 \Omega$ $I_{ges} = 9,143 \text{ mA}$ $U_{R1} = 9,143 \text{ V}$ $U_{R2} = 18,286 \text{ V}$ $U_{R3} = 20,571 \text{ V}$
 $I_{R3} = 4,57 \text{ mA}$ $I_{R4} = 4,57 \text{ mA}$ $U_{R4} = 11,429 \text{ V}$ $U_{R5} = 9,143 \text{ V}$
 $I_{R5} = 3,048 \text{ mA}$ $I_{R6} = I_{R7} = 1,524 \text{ mA}$ $U_{R6} = 6,095 \text{ V}$ $U_{R7} = 3,048 \text{ V}$

A6: Lös:

$R_{ers} = R_{ges} = 132,4 \Omega$ $U_{ges} = 198,6 \text{ V}$ $U_5 = 48,65 \text{ V}$ $I_4 = 0,608 \text{ A}$

A7: Lös: \rightarrow Index 1 $\hat{=}$ geöffnet, Index 2 $\hat{=}$ geschlossen

$R_{ges1} = 6 \text{ k}\Omega$ $R_1 = 3 \text{ k}\Omega$ $U_{R11} = 24 \text{ V}$ $U_{rel1} = 24 \text{ V}$
 $U_{rel2} = 16 \text{ V}$ $U_{R12} = 32 \text{ V}$ $I_{ges2} = 10,67 \text{ mA}$ $I_{rel2} = 5,33 \text{ mA}$
 $I_{R2} = 5,33 \text{ mA}$ $R_2 = 3 \text{ k}\Omega$ $R_{ges2} = 4,5 \text{ k}\Omega$

A8: Lös: a) A–B, b) A–C, c) A–D, d) B–C, e) B–D, f) C–D

$R_1 = 180 \Omega$ $R_2 = 270 \Omega$ $R_3 = 120 \Omega$ $R_4 = 150 \Omega$ $R_5 = 470 \Omega$ $R_6 = 220 \Omega$

a) **U an A–B**

$R_{ges} = 106,71 \Omega$ $U_1 = U_{ges} = 9 \text{ V}$ $I_1 = 50 \text{ mA}$ $I_3 = 34,34 \text{ mA}$
 $U_3 = 4,121 \text{ V}$ $U_2 = 4,879 \text{ V}$ $I_2 = 18,07 \text{ mA}$ $I_4 = 16,27 \text{ mA}$
 $U_4 = 2,441 \text{ V}$ $U_5 = 2,438 \text{ V}$ $I_5 = 5,19 \text{ mA}$ $I_6 = 11,08 \text{ mA}$
 $I_{ges} = 84,34 \text{ mA}$

b) **U an A–C**

$R_{ges} = 87,43 \Omega$ $I_{ges} = 102,94 \text{ mA}$ $I_3 = 75 \text{ mA}$ $I_1 = 27,94 \text{ mA}$
 $U_1 = 5,03 \text{ V}$ $U_2 = 3,97 \text{ V}$ $I_2 = 14,7 \text{ mA}$ $I_4 = 13,24 \text{ mA}$
 $U_4 = 1,986 \text{ V}$ $U_5 = 1,984 \text{ V}$ $I_5 = 4,22 \text{ mA}$ $I_6 = 9,02 \text{ mA}$

c) **U an A–D → nur lösbar mittels Dreieck-Stern-Umwandlung**

$$\begin{array}{llll}
 R_{10} = 37,895 \, \Omega & R_{20} = 85,263 \, \Omega & R_{30} = 56,842 \, \Omega & \\
 R_{\text{ges}} = 147,92 \, \Omega & I_{\text{ges}} = 60,84 \, \text{mA} & U_{R10} = U_1 = 2,306 \, \text{V} & U_2 = 6,694 \, \text{V} \\
 I_4 = 28,453 \, \text{mA} & U_{R4} = 4,268 \, \text{V} & I_{56} = 32,385 \, \text{mA} & U_5 = U_6 = 4,853 \, \text{V} \\
 U_{R1} = 4,732 \, \text{V} & U_{R3} = 4,147 \, \text{V} & U_{R2} = 0,585 \, \text{V} & I_1 = 26,29 \, \text{mA} \\
 I_2 = 2,167 \, \text{mA} & I_3 = 34,56 \, \text{mA} & &
 \end{array}$$

d) **U an B–C**

$$\begin{array}{llll}
 R_{\text{ges}} = 96,4 \, \Omega & I_{\text{ges}} = 93,36 \, \text{mA} & I_1 = 30 \, \text{mA} & U_2 = 9 \, \text{V} \\
 U_1 = 5,4 \, \text{V} & U_3 = 3,6 \, \text{V} & I_2 = 33,3 \, \text{mA} & I_4 = 30 \, \text{mA} \\
 U_4 = 4,5 \, \text{V} & U_5 = 4,5 \, \text{V} & I_5 = 9,57 \, \text{mA} & I_6 = 20,5 \, \text{mA}
 \end{array}$$

e) **U an B–D**

$$\begin{array}{llll}
 R_{\text{ges}} = 99,09 \, \Omega & I_{\text{ges}} = 90,83 \, \text{mA} & U_4 = 9 \, \text{V} & I_4 = 60 \, \text{mA} \\
 I_{56} = 30,84 \, \text{mA} & U_5 = 4,62 \, \text{V} & I_5 = 9,83 \, \text{mA} & I_6 = 21 \, \text{mA} \\
 U_2 = 4,38 \, \text{V} & I_2 = 16,22 \, \text{mA} & I_1 = 14,6 \, \text{mA} & U_1 = 2,628 \, \text{V} \\
 U_3 = 1,752 \, \text{V} & & &
 \end{array}$$

f) **U an C–D**

$$\begin{array}{llll}
 R_{\text{ges}} = 99,04 \, \Omega & I_{\text{ges}} = 90,87 \, \text{mA} & U = U_5 = U_6 = 9 \, \text{V} & I_5 = 19,15 \, \text{mA} \\
 I_6 = 40,91 \, \text{mA} & I_4 = 30,81 \, \text{mA} & U_4 = 4,62 \, \text{V} & U_2 = 4,38 \, \text{V} \\
 I_2 = 16,22 \, \text{mA} & I_1 = I_3 = 14,6 \, \text{mA} & U_1 = 2,63 \, \text{V} & U_3 = 1,75 \, \text{V}
 \end{array}$$

A9: Lös:

$$R_{\text{ges}} = 730,9 \, \Omega \quad U_{R4} = 17,63 \, \text{V} \quad I_7 = 7,1 \, \text{mA}$$