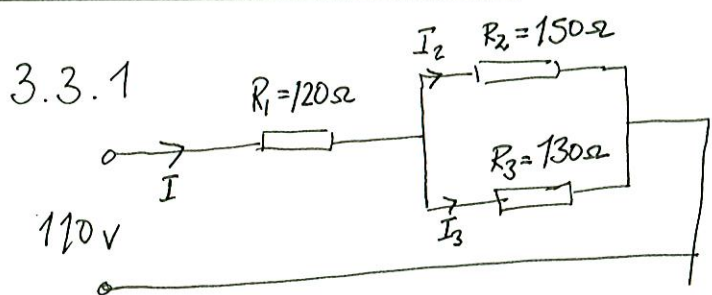


3.3. BLANDET KOPLING



$$\frac{1}{R_p} = \frac{1}{R_2} + \frac{1}{R_3} = \frac{1}{150\Omega} + \frac{1}{130\Omega}$$

$$R_p = \underline{69,6\Omega}$$

$$R_T = R_1 + R_p = 120\Omega + 69,6\Omega = \underline{189,6\Omega}$$

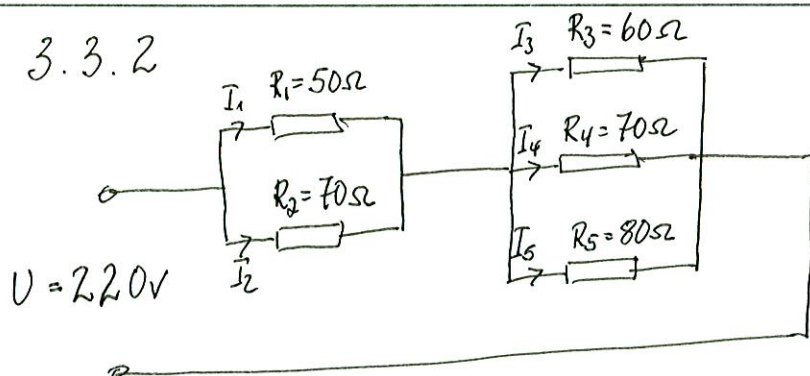
$$I = \frac{U}{R_T} = \frac{110V}{189,6\Omega} = \underline{0,58A}$$

$$\Delta U_1 = I \cdot R_1 = 0,58A \cdot 120\Omega = \underline{69,6V}$$

$$\Delta U_p = I \cdot R_p = 0,58A \cdot 69,6V = \underline{40,4V}$$

$$I_2 = \frac{\Delta U_p}{R_2} = \frac{40,4V}{150\Omega} = \underline{0,269A} = \underline{269mA}$$

$$I_3 = \frac{\Delta U_p}{R_3} = \frac{40,4V}{130\Omega} = \underline{0,311A} = \underline{311mA}$$



a)

$$\frac{1}{R_{p1}} = \frac{1}{R_1} + \frac{1}{R_2} = \frac{1}{50\Omega} + \frac{1}{70\Omega} \quad R_{p1} = \underline{29,2\Omega}$$

$$\frac{1}{R_{p2}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} = \frac{1}{60\Omega} + \frac{1}{70\Omega} + \frac{1}{80\Omega} \quad R_{p2} = \underline{23,0\Omega}$$

$$R = R_{p1} + R_{p2} = 29,2\Omega + 23,0\Omega = \underline{52,2\Omega}$$

b)

$$I = \frac{U}{R} = \frac{220V}{52,2\Omega} = \underline{4,22A}$$

$$\Delta U_{p1} = I \cdot R_{p1} = 4,22A \cdot 29,2\Omega = \underline{123,1V}$$

$$\Delta U_{p2} = I \cdot R_{p2} = 4,22A \cdot 23,0\Omega = \underline{97,0V}$$

c)

$$I_1 = \frac{\Delta U_{p1}}{R_1} = \frac{123,1V}{50\Omega} = \underline{2,46A}$$

$$I_2 = \frac{\Delta U_{p1}}{R_2} = \frac{123,1V}{70\Omega} = \underline{1,76A}$$

$$I_3 = \frac{\Delta U_{p2}}{R_3} = \frac{97,0V}{60\Omega} = \underline{1,62A}$$

$$I_4 = \frac{\Delta U_{p2}}{R_4} = \frac{97,0V}{70\Omega} = \underline{1,39A}$$

$$I_5 = \frac{\Delta U_{p2}}{R_5} = \frac{97,0V}{80\Omega} = \underline{1,21A}$$

3.3.3

$$a) \frac{1}{R_p} = \frac{1}{R_2} + \frac{1}{R_3} + \frac{1}{R_4} = \frac{1}{120\Omega} + \frac{1}{100\Omega} + \frac{1}{90\Omega} \quad R_p = \underline{\underline{34,0\Omega}}$$

$$R = R_1 + R_p + R_5 = 100\Omega + 34,0\Omega + 70\Omega = \underline{\underline{204\Omega}}$$

$$b) I = \frac{U}{R} = \frac{70\text{V}}{204\Omega} = \underline{\underline{0,343\text{A}}} = \underline{\underline{343\text{mA}}}$$

$$\Delta U_1 = I \cdot R_1 = 0,343\text{A} \cdot 100\Omega = \underline{\underline{34,3\text{V}}}$$

$$\Delta U_p = I \cdot R_p = 0,343\text{A} \cdot 34,0\Omega = \underline{\underline{11,7\text{V}}}$$

$$\Delta U_5 = I \cdot R_5 = 0,343\text{A} \cdot 70\Omega = \underline{\underline{24,0\text{V}}}$$

$$c) I = \underline{\underline{343\text{mA}}}$$

$$I_2 = \frac{\Delta U_p}{R_2} = \frac{11,7\text{V}}{120\Omega} = \underline{\underline{97,5\text{mA}}} \quad I_3 = \frac{\Delta U_p}{R_3} = \frac{11,7\text{V}}{100\Omega} = \underline{\underline{117\text{mA}}} \quad I_4 = \frac{\Delta U_p}{R_4} = \frac{11,7\text{V}}{90\Omega} = \underline{\underline{130\text{mA}}}$$

3.3.4

$$a) \frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} = \frac{1}{30\Omega} + \frac{1}{40\Omega} = \quad R_p = \underline{\underline{17,1\Omega}}$$

$$R = R_p + R_3 + R_4 = 17,1\Omega + 20\Omega + 30\Omega = \underline{\underline{67,1\Omega}}$$

$$b) I = \frac{U}{R} = \frac{50\text{V}}{67,1\Omega} = \underline{\underline{0,745\text{A}}} = \underline{\underline{745\text{mA}}}$$

$$\Delta U_p = I \cdot R_p = 0,745\text{A} \cdot 17,1\Omega = \underline{\underline{12,7\text{V}}} \quad \Delta U_3 = I \cdot R_3 = 0,745\text{A} \cdot 20\Omega = \underline{\underline{14,9\text{V}}}$$

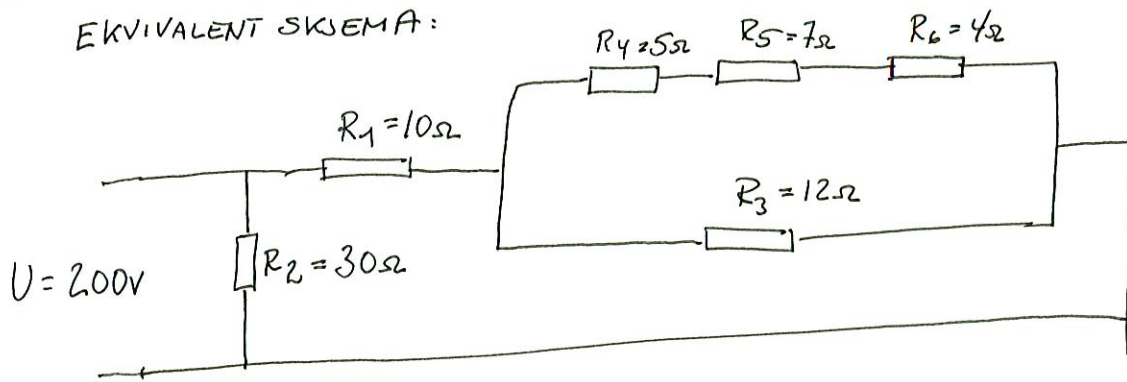
$$\Delta U_4 = I \cdot R_4 = 0,745\text{A} \cdot 30\Omega = \underline{\underline{22,3\text{V}}}$$

$$c) I = \underline{\underline{745\text{mA}}}$$

$$I_1 = \frac{\Delta U_p}{R_1} = \frac{12,7\text{V}}{30\Omega} = \underline{\underline{423\text{mA}}} \quad I_2 = \frac{\Delta U_p}{R_2} = \frac{12,7\text{V}}{40\Omega} = \underline{\underline{318\text{mA}}}$$

3.3.5

EKVIVALENT SKJEMA:



$$a) \quad \frac{1}{R_P} = \frac{1}{R_3} + \frac{1}{R_4 + R_5 + R_6} = \frac{1}{12\Omega} + \frac{1}{5\Omega + 7\Omega + 4\Omega} \quad R_P = \underline{6,86\Omega}$$

$$R_{P+1} = R_P + R_1 = 6,86\Omega + 10\Omega = \underline{16,86\Omega}$$

$$\frac{1}{R} = \frac{1}{R_2} + \frac{1}{R_{P+1}} = \frac{1}{30\Omega} + \frac{1}{16,86\Omega} \quad R = \underline{\underline{10,8\Omega}}$$

$$b) \quad I = \frac{U}{R} = \frac{200V}{10,8\Omega} = \underline{\underline{18,5A}}$$

$$I_2 = \frac{U}{R_2} = \frac{200V}{30\Omega} = \underline{\underline{6,67A}}$$

$$I_{P+1} = \frac{U}{R_{P+1}} = \frac{200V}{16,86\Omega} = \underline{\underline{11,9A}}$$

$$\Delta U_P = I_{P+1} \cdot R_P = 11,9A \cdot 6,86\Omega = \underline{\underline{81,4V}}$$

$$I_{4-5-6} = \frac{\Delta U_P}{R_4 + R_5 + R_6} = \frac{81,4V}{5\Omega + 7\Omega + 4\Omega} = \underline{\underline{5,09A}}$$

$$I_3 = \frac{\Delta U_P}{R_3} = \frac{81,4V}{12\Omega} = \underline{\underline{6,78A}}$$

$$c) \quad \Delta U_6 = I_{4-5-6} \cdot R_6 = 5,09A \cdot 4\Omega = \underline{\underline{20,4V}}$$

33.6

$$a) \frac{1}{R_{P1}} = \frac{1}{R_2} + \frac{1}{R_3} = \frac{1}{30\Omega} + \frac{1}{22\Omega} \Rightarrow R_{P1} = \underline{12,7\Omega}$$

$$\frac{1}{R_{P2}} = \frac{1}{R_5} + \frac{1}{R_6} = \frac{1}{7\Omega} + \frac{1}{4\Omega} \Rightarrow R_{P2} = \underline{2,55\Omega}$$

$$R = R_1 + R_{P1} + R_4 + R_{P2} = 10\Omega + 12,7\Omega + 5\Omega + 2,55\Omega = \underline{\underline{30,3\Omega}}$$

$$b) I = \frac{U}{R} = \frac{230V}{30,3\Omega} = \underline{\underline{7,6A}}$$

$$\Delta U_{P1} = I \cdot R_{P1} = 7,6A \cdot 12,7\Omega = \underline{96,4V}$$

$$\Delta U_{P2} = I \cdot R_{P2} = 7,6A \cdot 2,55\Omega = \underline{19,4V}$$

$$\Delta U_4 = I \cdot R_4 = 7,6A \cdot 5\Omega = \underline{\underline{38,0V}}$$

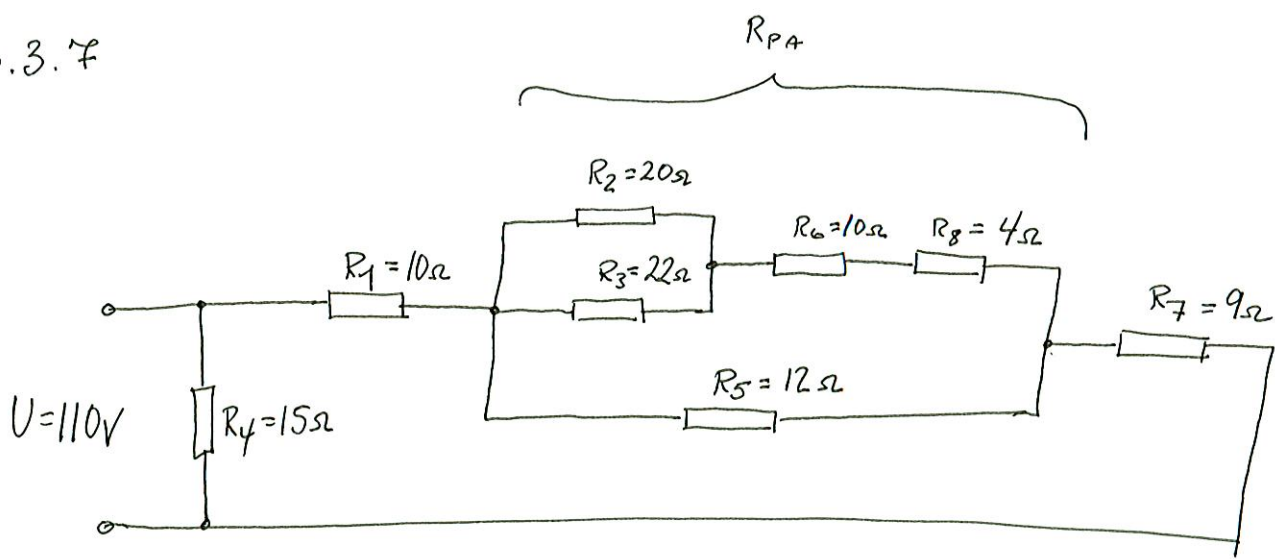
$$I_2 = \frac{\Delta U_{P1}}{R_2} = \frac{96,4V}{30\Omega} = \underline{\underline{3,21A}}$$

$$I_3 = \frac{\Delta U_{P1}}{R_3} = \frac{96,4V}{22\Omega} = \underline{\underline{4,39A}}$$

$$I_5 = \frac{\Delta U_{P2}}{R_5} = \frac{19,4V}{7\Omega} = \underline{\underline{2,77A}}$$

$$I_6 = \frac{\Delta U_{P2}}{R_6} = \frac{19,4V}{4\Omega} = \underline{\underline{4,85A}}$$

$$c) \Delta U_6 = \Delta U_{P2} = \underline{\underline{19,4V}}$$



$$a) \quad \frac{1}{R_{PA}} = \frac{1}{R_5} + \frac{1}{R_6 + R_8 + \frac{R_2 \cdot R_3}{R_2 + R_3}} = \frac{1}{12\Omega} + \frac{1}{10\Omega + 4\Omega + \frac{20\Omega \cdot 22\Omega}{20\Omega + 22\Omega}} \Rightarrow R_{PA} = \underline{8,05\Omega}$$

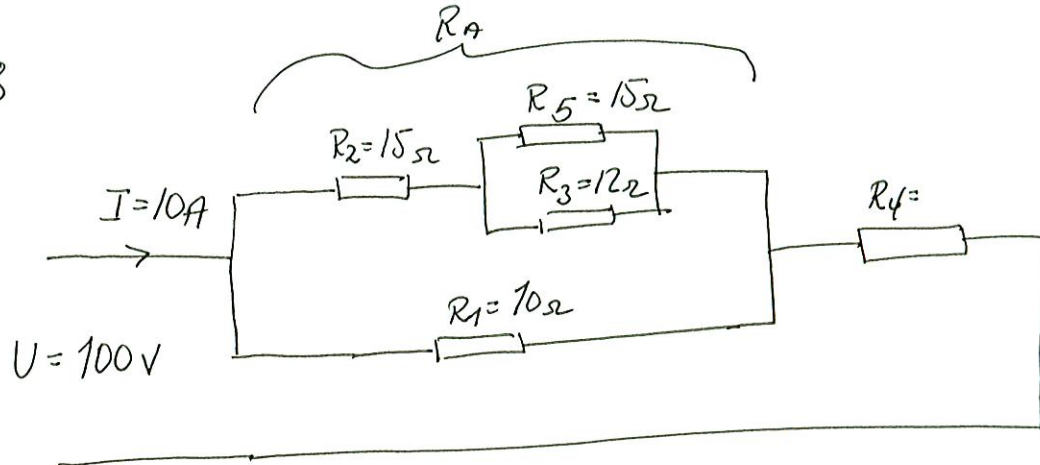
$$\frac{1}{R} = \frac{1}{R_4} + \frac{1}{R_1 + R_{PA} + R_7} = \frac{1}{15\Omega} + \frac{1}{10\Omega + 8,05\Omega + 9\Omega} \Rightarrow R = \underline{9,65\Omega}$$

$$b) \quad I = \frac{U}{R} = \frac{110V}{9,65\Omega} = \underline{11,4A}$$

$$I_1 = \frac{U}{R_1 + R_{PA} + R_7} = \frac{110V}{(10 + 8,05 + 9)\Omega} = \underline{4,07A}$$

$$\Delta U_{PA} = I_1 \cdot R_{PA} = 4,07A \cdot 8,05\Omega = \underline{32,7V}$$

$$I_6 = \frac{\Delta U_{PA}}{R_6 + R_8 + \frac{R_2 \cdot R_3}{R_2 + R_3}} = \frac{32,7V}{10\Omega + 4\Omega + \frac{20\Omega \cdot 22\Omega}{20\Omega + 22\Omega}} = \underline{1,34A}$$



$$a) R = \frac{U}{I} = \frac{100V}{10A} = \underline{\underline{10\Omega}}$$

b)

$$R = R_A + R_4$$

$$R = \frac{R_1 \cdot \left(R_2 + \frac{R_3 \cdot R_5}{R_3 + R_5} \right)}{R_1 + R_2 + \frac{R_3 \cdot R_5}{R_3 + R_5}} + R_4$$

$$R_4 = R - \frac{R_1 \cdot \left(R_2 + \frac{R_3 \cdot R_5}{R_3 + R_5} \right)}{R_1 + R_2 + \frac{R_3 \cdot R_5}{R_3 + R_5}} = 10\Omega - \frac{10\Omega \cdot \left(15\Omega + \frac{12\Omega \cdot 15\Omega}{12\Omega + 15\Omega} \right)}{10\Omega + 15\Omega + \frac{12\Omega \cdot 15\Omega}{12\Omega + 15\Omega}}$$

$$R_4 = \underline{\underline{3,16\Omega}}$$

$$\Delta U_4 = I \cdot R_4 = 10A \cdot 3,16\Omega = \underline{\underline{31,6V}}$$

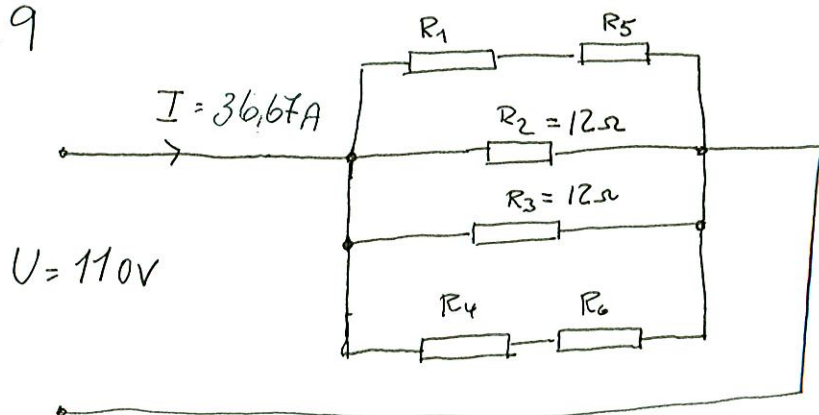
$$\Delta U_A = U - \Delta U_4 = 100V - 31,6V = \underline{\underline{68,4V}}$$

$$I_2 = \frac{\Delta U_A}{R_2} = \frac{\Delta U_A}{R_2 + \frac{R_3 \cdot R_5}{R_3 + R_5}} = \frac{68,4V}{15\Omega + \frac{12\Omega \cdot 15\Omega}{12\Omega + 15\Omega}} = \underline{\underline{3,16A}}$$

$$\Delta U_p = I_2 \cdot \frac{R_5 \cdot R_3}{R_5 + R_3} = 3,16A \cdot \frac{12\Omega \cdot 15\Omega}{12\Omega + 15\Omega} = \underline{\underline{21,0V}}$$

$$I_3 = \frac{\Delta U_p}{R_3} = \frac{21,0V}{12\Omega} = \underline{\underline{1,75A}}$$

3.3.9



$$R_1 = R_6 = R$$

$$R_4 = R_5 = R$$

$$R_1 = 2 \cdot R_5$$

$$\downarrow$$

$$R_6 = 2 \cdot R_4$$

$$R = R_1 = R_6$$

$$a) R = \frac{U}{I} = \frac{110V}{36,67A} = \underline{\underline{3 \Omega}}$$

$$b) \frac{1}{R} = \frac{1}{R_1 + R_5} + \frac{1}{R_4 + R_6} + \frac{1}{R_2} + \frac{1}{R_3}$$

$$\frac{1}{10 \Omega} = \frac{1}{R + 2R} + \frac{1}{2 \cdot R + R} + \frac{1}{12 \Omega} + \frac{1}{12 \Omega}$$

$$\frac{1}{R + 2R} + \frac{1}{2 \cdot R + R} = \frac{1}{3 \Omega} - \frac{1}{12 \Omega} - \frac{1}{12 \Omega}$$

$$2 \cdot \left(\frac{1}{R + 2 \cdot R} \right) = 0,167 \frac{1}{\Omega}$$

$$\frac{1}{R + 2 \cdot R} = \frac{0,167 \frac{1}{\Omega}}{2}$$

$$(R + 2 \cdot R) \cdot \left| \frac{1}{R + 2 \cdot R} \right. = 0,0833 \frac{1}{\Omega} \cdot (R + 2 \cdot R)$$

$$(0,0833) \cdot \left| 1 \right. = (0,0833 \cdot \frac{1}{\Omega}) \cdot (R + 2 \cdot R) \cdot \left| \cdot (0,0833) \right.$$

$$\frac{1}{0,0833 \frac{1}{\Omega}} = R + 2 \cdot R$$

$$12 \Omega = R + 2 \cdot R$$

$$(1+2) \cdot \left| 12 \Omega = R(1+2) \right. \cdot \left| \cdot (1+2) \right.$$

$$\frac{12 \Omega}{1+2} = R$$

$$R = \frac{12 \Omega}{3}$$

$$R = \underline{\underline{4 \Omega}}$$

$$R_4 = R_6 = R = \underline{\underline{4 \Omega}}$$

$$R_4 = R_5 = 2 \cdot R = \underline{\underline{8 \Omega}}$$