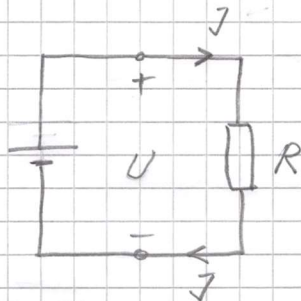


FÖRELÄSNING 1

EX 1 * OHMS LAG

$$J = ?$$



$$U = 1,5 \text{ V}$$

$$R = 30 \Omega$$

$$U = R \cdot J$$

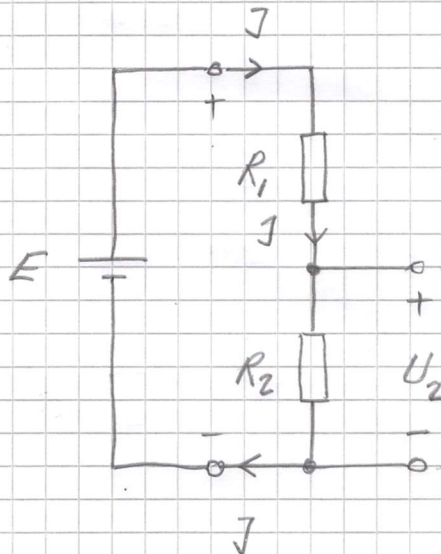
\Rightarrow

$$J = \frac{1,5}{30} = 0,050 \text{ A}$$

$$\underline{\underline{50 \text{ mA}}}$$

EX 2 * SPÄNNINGSDELNINGSLAGEN

$$U_2 = ?$$



$$E = 10 \text{ V}$$

$$R_1 = 100 \text{ k}\Omega$$

$$R_2 = 150 \text{ k}\Omega$$

$$J = \frac{E}{R_1 + R_2}$$

$$J = \frac{U_2}{R_2}$$

\Rightarrow

$$U_2 = E \cdot \frac{R_2}{R_1 + R_2}$$

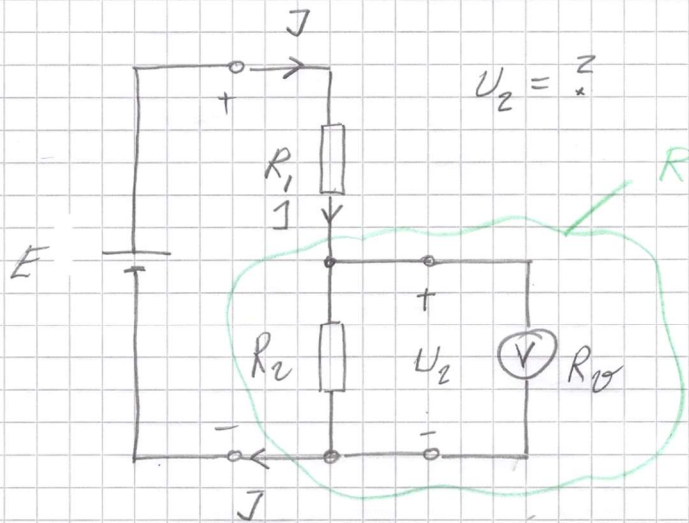
\Rightarrow

$$\underline{\underline{U_2 = 6,0 \text{ V}}}$$

$$\left(U_1 = E - U_2 \text{ ELLER } U_1 = E \cdot \frac{R_1}{R_1 + R_2} \right)$$

$$\Rightarrow U_1 = 4,0 \text{ V}$$

INKOPPLING AV VOLTMETER $R_{v2} = 300 \text{ k}\Omega$



$$U_2 = E \cdot \frac{R}{R_1 + R}$$

$$\frac{1}{R} = \frac{1}{R_2} + \frac{1}{R_v} \Rightarrow R = \frac{R_2 R_v}{R_2 + R_v}$$

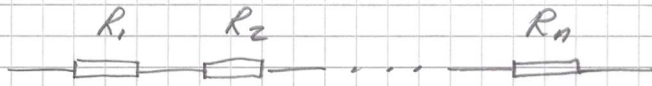
$$\Rightarrow R = 100 \text{ k}\Omega$$

$$\Rightarrow U_2 = 5,0 \text{ V MÄTFEL!}$$

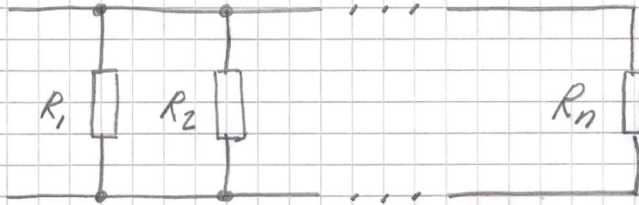
VID MÄTNING MÅSTE $R_v \gg R_2$

$$\left(U_1 = E - U_2 \Rightarrow U_1 = 5,0 \text{ V} \right)$$

* SERIE - OCH PARALLELLKOPPLING AV RESISTORER



$$R = R_1 + R_2 + \dots + R_n$$

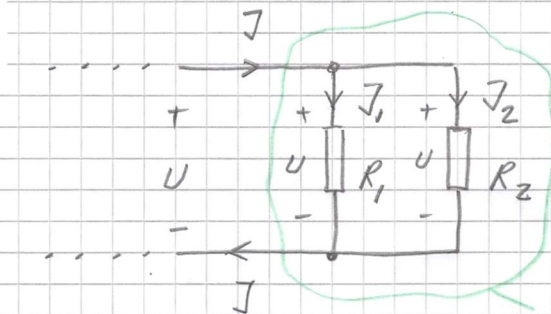


$$R = \left(\frac{1}{R_1} + \frac{1}{R_2} + \dots + \frac{1}{R_n} \right)^{-1}$$

EX 3 * STRÖMDELNINGSLAGEN

$$J_1 = ?$$

$$J_2 = ?$$



$$J = 1,2 \text{ A}$$

$$R_1 = 4,0 \Omega$$

$$R_2 = 8,0 \Omega$$

$$\frac{R_1 R_2}{R_1 + R_2}$$

$$U = \frac{R_1 R_2}{R_1 + R_2} \cdot J$$

$$U = R_1 \cdot J_1$$

$$(U = R_2 \cdot J_2)$$

$$J_1 = J \cdot \frac{R_2}{R_1 + R_2}$$

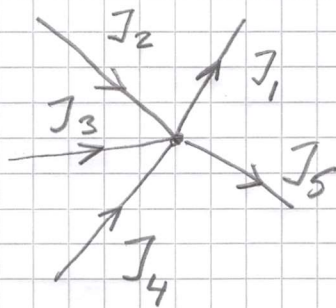
$$(J_2 = J \cdot \frac{R_1}{R_1 + R_2})$$

ELLER $J_2 = J - J_1$

$$\Rightarrow \underline{I_1 = 0,80 \text{ A}}$$

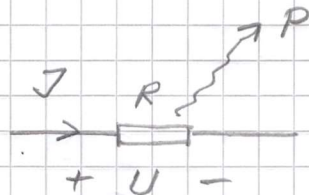
$$\underline{I_2 = 0,40 \text{ A}}$$

* KIRCHHOFFS STRÖMLAG (KCL ELLER KI)



$$I_2 + I_3 + I_4 = I_1 + I_5$$

* ELEKTRISK EFFEKT

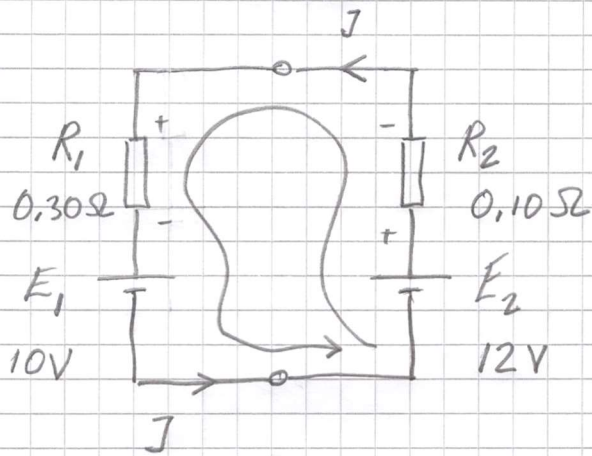


$$P = U \cdot I$$

$$U = R \cdot I \quad \Rightarrow \quad P = R \cdot I^2$$

$$I = \frac{U}{R} \quad \Rightarrow \quad P = \frac{U^2}{R}$$

Ex 4 * KIRCHHOFFS SPÄNNINGSLAG (KVL ELLER KII)



"
BERÄKNA VILKEN EFFEKT SOM
RESPEKTIVE SPÄNNINGS-
" KÄLLA LEVERERAR OCH
" VILKEN EFFEKT SOM
" FÖRBRUKAS I RESISTORERNA.

$$\text{KVL} \rightarrow +E_2 - R_2 J - R_1 J - E_1 = 0$$

$$\Rightarrow J = \frac{E_2 - E_1}{R_1 + R_2} \Rightarrow J = 5,0 \text{ A}$$

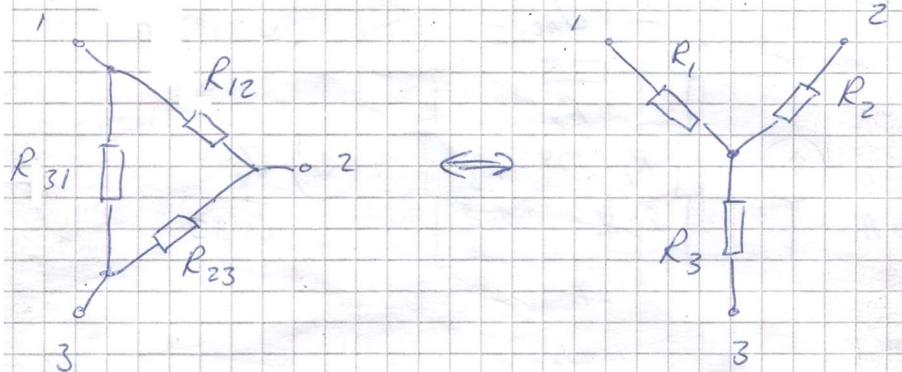
$$P_2 = E_2 \cdot J \Rightarrow P_2 = 60 \text{ W}$$

$$P_1 = -E_1 \cdot J \Rightarrow P_1 = -50 \text{ W}$$

$$P_{R2} = R_2 \cdot J^2 \Rightarrow P_{R2} = 2,5 \text{ W}$$

$$P_{R1} = R_1 \cdot J^2 \Rightarrow P_{R1} = 7,5 \text{ W}$$

* D/Y - TRANSFORMATION



$$\frac{R_{31} \cdot (R_{12} + R_{23})}{R_{31} + (R_{12} + R_{23})} = R_1 + R_3$$

$$\frac{R_{12} \cdot (R_{23} + R_{31})}{R_{12} + (R_{23} + R_{31})} = R_1 + R_2$$

$$\frac{R_{23} \cdot (R_{12} + R_{31})}{R_{23} + (R_{12} + R_{31})} = R_2 + R_3$$

→

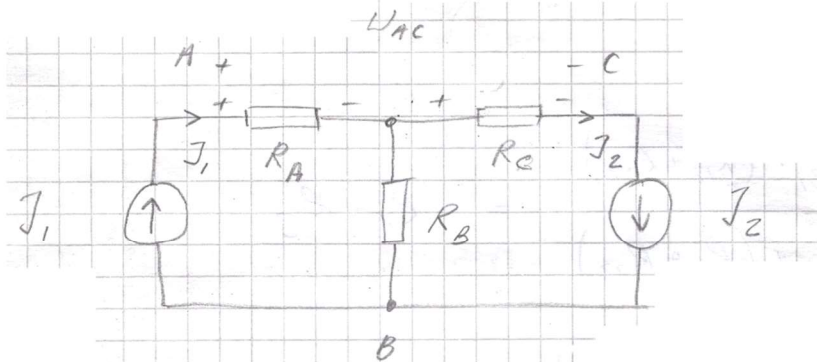
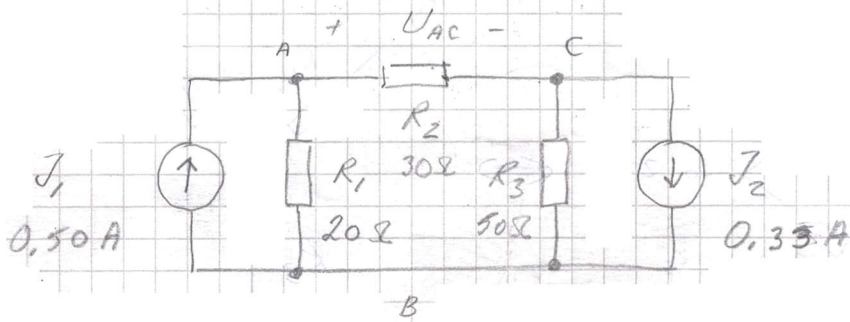
$$R_1 = \frac{R_{12} \cdot R_{31}}{R_{12} + R_{23} + R_{31}}$$

$$R_2 = \frac{R_{12} \cdot R_{23}}{R_{12} + R_{23} + R_{31}}$$

$$R_3 = \frac{R_{23} \cdot R_{31}}{R_{12} + R_{23} + R_{31}}$$

Ex 5

" BERAKNA U_{AC}



$$U_{AC} = R_A J_1 + R_C J_2 \quad \dots (1)$$

$$R_A = \frac{R_1 R_2}{R_1 + R_2 + R_3} = 6,0 \, \Omega$$

$$R_B = \frac{R_1 R_3}{R_1 + R_2 + R_3} = 10 \, \Omega$$

$$R_C = \frac{R_2 R_3}{R_1 + R_2 + R_3} = 15 \, \Omega$$

$$(1) \rightarrow U_{AC} = 6,0 \cdot 0,50 + 15 \cdot 0,33 = \underline{8,0 \, V}$$