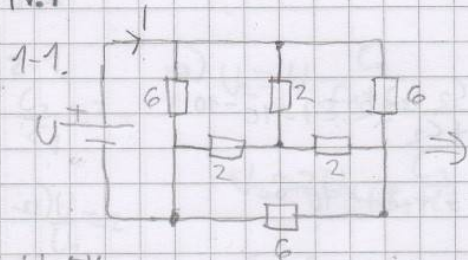
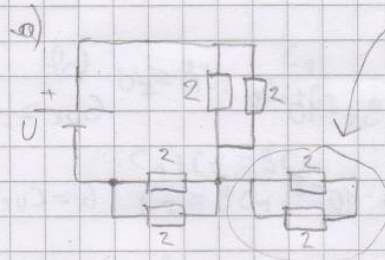


IV.1

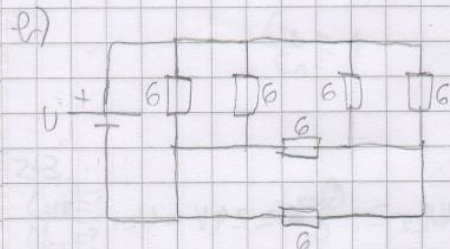


$U = 5V$
 $I = ?$



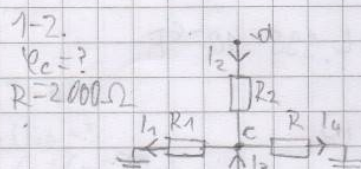
$R_{uk} = (2 || 2) + (2 || 2) = 2 \Omega$

$I = \frac{U}{R_{uk}} = 2.5 A$



$R_{uk} = [(6 || 6) + (6 || 6)] || (6 || 6) = 2 \Omega$

$I = \frac{U}{R_{uk}} = 2.5 A$



$R_1 = 2000 \Omega$
 $R_2 = 3000 \Omega$
 $R_3 = 1000 \Omega$
 $V_a = 12V$
 $V_b = 10V$

$I_1 + I_4 = I_2 + I_3$ $R_1 = R$ $I_1 = \frac{V_c}{R_1}$ $I_4 = \frac{V_c}{R}$ $I_2 = \frac{V_a - V_c}{R_2}$ $I_3 = \frac{V_b - V_c}{R_3}$

$\frac{V_c}{R_1} + \frac{V_c}{R} = \frac{V_a - V_c}{R_2} + \frac{V_b - V_c}{R_3}$

$\frac{2V_c}{R} = \frac{R_3(V_a - V_c) + R_2(V_b - V_c)}{R_2 R_3}$

$2R_2 R_3 V_c - R R_3 V_a + R R_3 V_c - R R_2 V_b + R R_2 V_c = 0$

$V_c (2R_2 R_3 + R R_3 + R R_2) = R R_3 V_a + R R_2 V_b$

$V_c = \frac{R R_3 V_a + R R_2 V_b}{2R_2 R_3 + R R_3 + R R_2}$

$V_c = 6V$

a) $R = \infty$ $I_4 = 0$

$I_1 = I_2 + I_3$

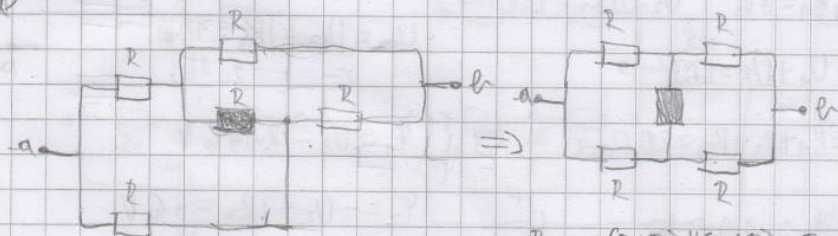
$\frac{V_a}{R_1} = \frac{V_a - V_c}{R_2} + \frac{V_b - V_c}{R_3}$

...

$V_c = 7.636V$

b) V_c JE KRAJNO SPOJEN NA MASU, ZBOG TOGA JE NJEGOVA POTENCIJAL 0

1-3.
 $R = 1 \Omega$
 $R_{uk} = ?$

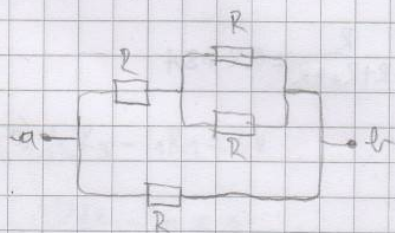


$R \cdot R = R \cdot R$
 MOST JE U RAVNOTEŽI PA
 KROZ ZATAMLJENI OTPORNIK
 NE TEČE STRUJA I MOŽEMO
 GA ODSPOJITI ILI KRATKO
 SPOJITI

$$R_{uk} = (R+R) \parallel (R+R) = R$$

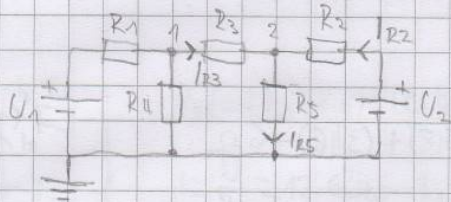
$$R_{uk} = 1 \Omega$$

2) ZATAMLJENI OTPORNIK JE KRATKO SPOJEN



$$R_{uk} = [R + (R \parallel R)] \parallel R = 0.6 \Omega$$

1-4.
 $|I_2|, |I_3|, |I_5| = ?$
 $R_3 = 4 \Omega$
 $R_1 = 6 \Omega$
 $U_1 = 12V$
 $\varphi_1 = 12V$
 $\varphi_2 = 3.86V$



$$U_{R3} = \varphi_1 - \varphi_2 = 2.04V$$

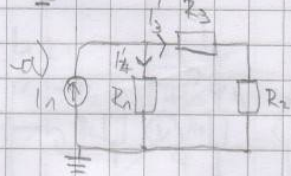
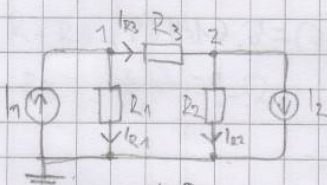
$$U_{R2} = U_2 - \varphi_2 = 2.04V$$

$$I_{R3} = \frac{U_{R3}}{R_3} = 0.51A$$

$$I_{R2} = \frac{U_{R2}}{R_2} = 0.34A$$

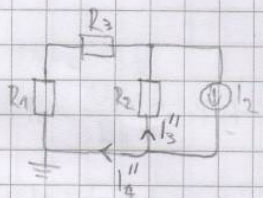
$$I_{R5} = I_{R2} + I_{R3} = 0.85A$$

1-5.
 $\varphi_1 = ?$
 $\varphi_2 = ?$
 $U_{12} = ?$
 $I_{R3} = ?$
 $R_1 = 2 \Omega$
 $R_2 = 6 \Omega$
 $R_3 = 12 \Omega$
 $I_1 = 4A$
 $I_2 = 2A$



$$I_4 = I_1 \frac{R_2 + R_3}{R_1 + R_2 + R_3} = 3.6A$$

$$I_3' = \frac{R_1}{R_1 + R_2 + R_3} = 0.9A$$



$$I_4'' = I_2 \frac{R_2}{R_1 + R_3 + R_2} = 0.6A$$

$$I_3'' = I_2 \frac{R_1 + R_3}{R_1 + R_2 + R_3} = 1.4A$$

$$\varphi_1 - 0 = U_{R1} = I_{R1} R_1$$

$$\varphi_1 = 6V$$

$$U_{12} = \varphi_1 - \varphi_2 = 12V$$

$$\varphi_2 - 0 = U_{R2} = I_{R2} R_2$$

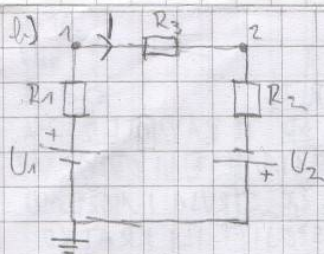
$$\varphi_2 = -6V$$

$$I_{R3} = I_3' + I_4'' = 1A$$

$$I_{R1} = I_4 - I_4'' = 3A$$

$$I_{R2} = I_3 - I_3'' = -1A$$

(MINUS ZNAČI DA ZAPRAVO IDE PREMA GORE, A NE KAKO JE NACRTANO NA CRTEŽU)



$$U_1 = I_1 R_1 = 8V \quad U_2 = I_2 R_2 = 12V$$

$$U_{UK} = U_1 + U_2 = 20V$$

$$R_{UK} = R_1 + R_2 + R_3 = 20\Omega$$

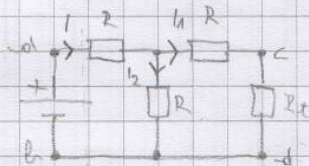
$$I = \frac{U_{UK}}{R_{UK}} = 1A = I_{R3}$$

$$U_{R3} = U_{R3} = I R_3 = 12V$$

$$U_1 = U_1 - I R_1 = 6V$$

$$U_2 = -U_2 + I R_2 = -6V$$

1-6.
 $U_{CD} = ?$
 $U_{AB} = 12V$
 $R_t = 100\Omega$
 $R = 57.735\Omega$



$$R_{UK} = R + (R + R_t) \parallel R = 100\Omega$$

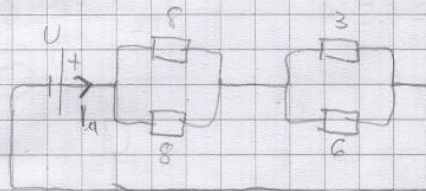
$$I = \frac{U}{R_{UK}} = 0.12A$$

$$I_1 = I \frac{R}{R + R_t + R} = 0.268A$$

$$U_{CD} = I_1 R_t = 26.8V$$

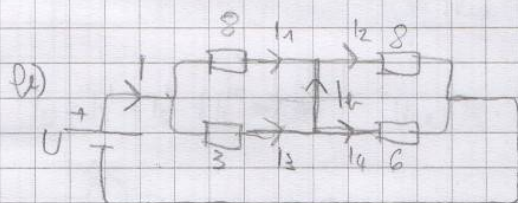
$$\frac{U_{CD}}{U_{AB}} = 0.268$$

1-7.
 $U = 12V$
 $I = ?$



$$R_{UK} = (8 \parallel 8) + (3 \parallel 6) = 6\Omega$$

$$I_a = \frac{U}{R_{UK}} = 2A$$



$$R_{UK} = (8 \parallel 3) + (8 \parallel 6) = 5.61\Omega$$

$$I = \frac{U}{R_{UK}} = 2.14A$$

$$I_2 = I_1 + I_2$$

$$I_1 = I \frac{3}{3+8} = 0.583A$$

$$I_2 = I \frac{6}{8+6} = 0.317A$$

$$I_a = 0.333A$$

c) SUPERPOZICIJA $\Rightarrow I_c = I_a + I_e = 2.333A$

1-8.

$$U = 72V$$

$$R = 5\Omega$$

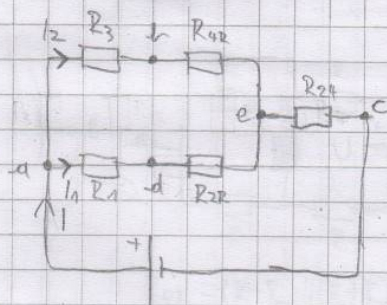
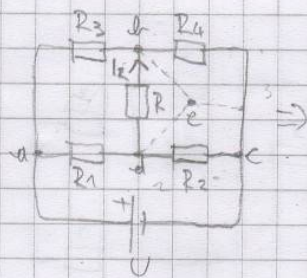
$$R_1 = 6\Omega$$

$$R_2 = 3\Omega$$

$$R_3 = 12\Omega$$

$$R_4 = 4\Omega$$

$$I_R = ?$$



$$R_{42} = \frac{R_3 R_4}{R_3 + R_4 + R} = \frac{5}{3}\Omega$$

$$R_{22} = \frac{R_2 R}{R_2 + R_4 + R} = 1.25\Omega$$

$$R_{24} = \frac{R_2 R_4}{R_2 + R_4 + R} = 1$$

$$R_{UK} = (R_3 + R_{42}) \parallel (R_1 + R_{22}) + R_{24}$$

$$R_{UK} = 5.737\Omega$$

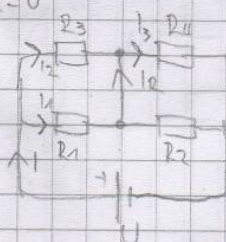
$$I = \frac{U}{R_{UK}} = 12.55V \quad I_1 = I \frac{R_3 + R_{42}}{R_1 + R_{22} + R_3 + R_{42}} = 8.2A$$

$$I_2 = I \frac{R_1 + R_{22}}{R_1 + R_{22} + R_3 + R_{42}} = 4.35A$$

$$U_{dR} = I_2 R_3 - I_1 R_1 = 3V$$

$$I_R = \frac{U_{dR}}{R} = 0.6A$$

b) $R = 0$



$$R_{UK} = (R_1 \parallel R_3) + (R_2 \parallel R_4) = 5.714\Omega$$

$$I = \frac{U}{R_{UK}} = 12.6\Omega \quad I_2 = I \frac{R_1}{R_1 + R_3} = 6.2A \quad I_3 = I \frac{R_2}{R_2 + R_4} = 5.4A$$

$$I_R = I_3 - I_2 = 1.2A$$

c) $I_R = 0 \Rightarrow R_1 R_4 = R_2 R_3$

$$R_1 = \frac{R_2 R_3}{R_4} = 9\Omega$$

1-9.

$$U = ?$$

$$U_V = 15V$$

$$U = ?$$

$$U_V = ?$$

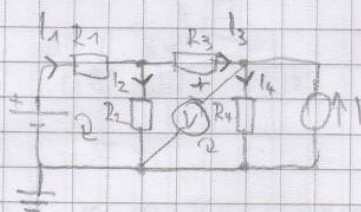
$$R_1 = 10\Omega$$

$$R_2 = 10\Omega$$

$$R_3 = 5\Omega$$

$$R_4 = 10\Omega$$

$$I = 1A$$



$$U_{R4} = 15V$$

$$I_4 = \frac{U_{R4}}{R_4} = 1.5A$$

$$I_4 = I_3 + I$$

$$I_3 = 0.5A$$

$$I_2 R_2 = I_3 R_3 + I_4 R_4$$

$$I_2 = \frac{I_3 R_3 + I_4 R_4}{R_2} = 1.75A$$

$$I_1 = I_2 + I_3 = 2.25A$$

$$U = 20V$$

$$U_V = ?$$

$$R_{UK} = R_1 + (R_3 + R_4) \parallel R_2$$

$$R_{UK} = 16\Omega$$

$$U = I_1 R_1 + I_2 R_2$$

$$U = 40V$$

$$I_1 = \frac{U}{R_{UK}} = 1.25A$$

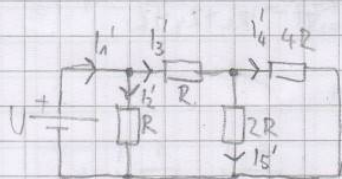
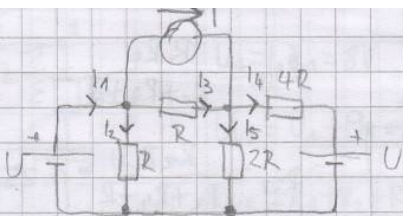
$$I_2 R_2 = U - I_1 R_1$$

$$I_2 = 0.75A$$

$$I_3 = I_1 - I_2 = 0.5A$$

$$U_4 = I_2 R_2 - I_3 R_3 = 5V = U_V$$

7-10.
 $U_{2R} = ?$
 $R = 5\Omega$
 $I = 2A$
 $U = 20V$



$$R_{UK} = [(2R \parallel 4R) + R] \parallel R = 3.5\Omega$$

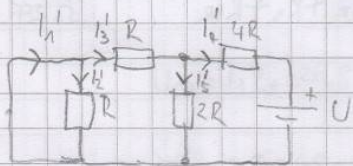
$$I_1 = \frac{U}{R_{UK}} = 5.71A$$

$$I_2 = \frac{U}{R} = 4A$$

$$I_3 = I_1 - I_2 = 1.71A$$

$$I_5' 2R = I_2 R - I_3 R$$

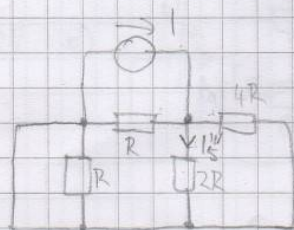
$$I_5' = 1.14A$$



$$R_{UK} = 4R + (2R \parallel R) = 23.3\Omega$$

$$I_4'' = -\frac{U}{R_{UK}} = -0.86A$$

$$I_5'' = I_4 \frac{R}{2R + R} = 0.29A$$



$$\frac{1}{R_{UK}} = \frac{1}{R} + \frac{1}{2R} + \frac{1}{4R} = \frac{4+2+1}{4R}$$

$$R_{UK} = 2.86\Omega$$

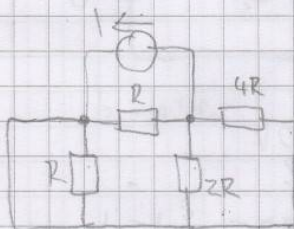
$$U = I R_{UK} = 5.71V$$

$$I_5''' = \frac{U}{2R} = 0.57A$$

$$I_5 = I_5' + I_5'' + I_5''' = 2A$$

$$U_{2R} = I_5 \cdot 2R = 20V$$

b.)



$$U = -5.71V$$

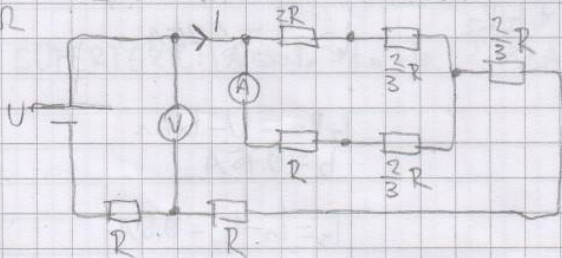
$$I_5''' = -0.57A$$

$$I_5 = 0.86A$$

$$U_{2R} = 8.6V$$

7-11.
 $U_V = 7V$
 $R = 1\Omega$
 $I_A = ?$

DESNI TROKUT \rightarrow ZVIJEZDU



$$R_{UK} = [(2R + \frac{2}{3}R) \parallel (R + \frac{2}{3}R)] + \frac{2}{3}R + R = 2.693$$

OVO JE BEZ ONOG R DOLJE LIJEVO

$$I = \frac{U_V}{R_{UK}} = 2.6A$$

$$I_A = I \frac{2R + \frac{2}{3}R}{2R + \frac{2}{3}R + R + \frac{2}{3}R} = 1.6A$$

1-12.

$R_3 = ?$

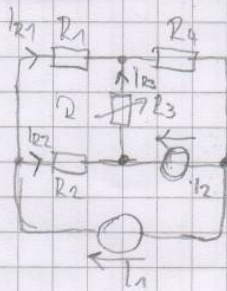
$R_1 = 100 \Omega$

$R_2 = 50 \Omega$

$R_4 = 50 \Omega$

$I_1 = 4 A$

$I_2 = 1 A$



$$\begin{aligned} I_1 &= I_{R1} + I_{R2} \\ I_{R1} &= I_{R2} \end{aligned} \quad \left. \begin{aligned} I_{R1} &= 2 A \\ I_{R2} &= 2 A \end{aligned} \right\}$$

$$\begin{aligned} I_2 + I_{R2} &= I_{R3} \\ I_{R3} &= 3 A \end{aligned}$$

$$I_{R1} R_1 = I_{R3} R_3 + I_{R2} R_2$$

$$R_3 = \frac{I_{R1} R_1 - I_{R2} R_2}{I_{R3}}$$

$$R_3 = 33.3 \Omega$$

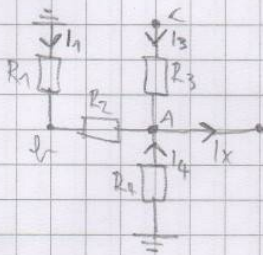
1-13.

$\varphi_A = -6 V$

$\varphi_C = 18 V$

$I_x = ?$

$\varphi_D = ?$



$R_1 = 7 \Omega$

$R_2 = 6 \Omega$

$R_3 = 3 \Omega$

$R_4 = 2 \Omega$

$$U_{R3} = \varphi_C - \varphi_A = 24 V$$

$$I_3 = \frac{U_{R3}}{R_3} = 8 A$$

$$U_{R4} = 0 - \varphi_A = 6 V$$

$$I_4 = \frac{U_{R4}}{R_4} = 3 A$$

$$U_{R12} = 0 - \varphi_A = 6 V$$

$$I_x = \frac{U_{R12}}{R_1 + R_2} = 0.46 A$$

$$I_x = I_1 + I_3 + I_4 = 11.46 A$$

$$U_{R1} = I_1 R_1 = 3.23 V$$

$$U_{R1} = 0 - \varphi_D$$

$$\varphi_D = -3.23 V$$