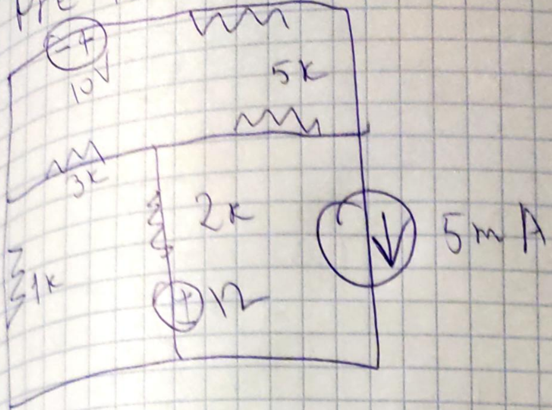
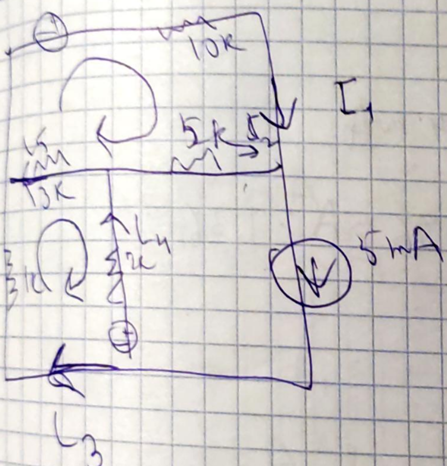
Pre lab



1. KCl & KVL

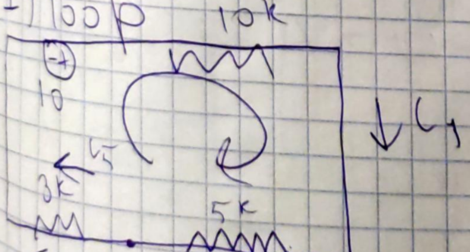


$i_1 + i_2 = 5mA$

$i_3 + i_4 = 5mA$

$i_3 + i_5 = i_1$

I) loop



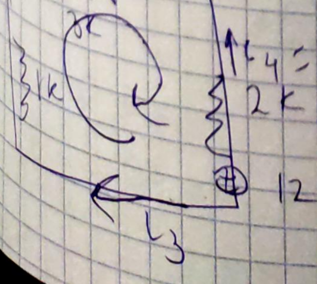
$i_5 = i_1 - i_3$ $\quad$ $i_2 = 5mA - i_1$

$-10 + 10k\,i_1 - 5k(5mA - i_1) + 3k(i_1 - i_3) = 0$

$18k\,i_1 - 3k\,i_3 = 35$

II loop

$i_5 = i_1 - i_3$



$i_4 = 5mA - i_3$

$1k\,i_3 - 3k(i_1 - i_3) - 2k(5mA - i_3) + 12 = 0$

$6k\,i_3 - 3k\,i_1 = -2$

$18k\,i_1 - 3k\,i_3 = 35$

$6k\,i_3 - 3k\,i_1 = -2$

$33k\,i_1 = 68$

$i_1 = 2.06\,mA$

$i_2 = 5\,mA - i_1$

$i_2 = 2{,}94\,mA$

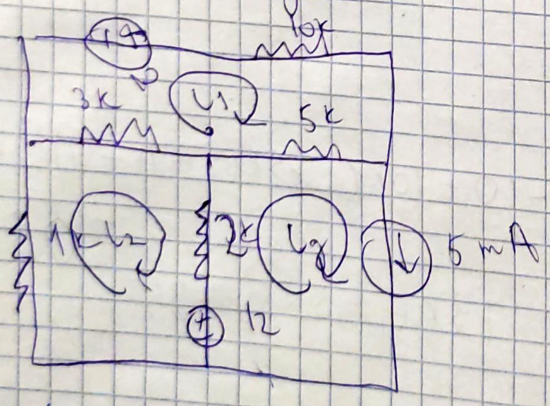
$i_3 = (-2 + 3k \cdot 2.06\,mA) \cdot \frac{1}{6}$

$i_3 = \frac{4.18\,mA}{6} = 0{,}696\,mA$

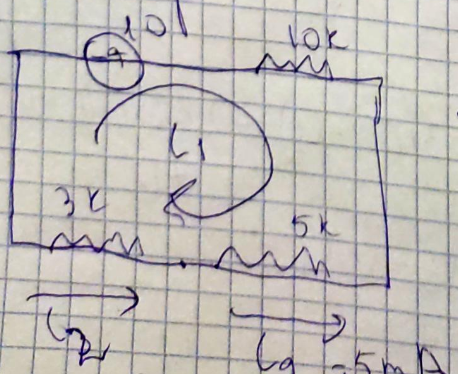
$i_4 = 5 - 0{,}696\,mA = 4{,}304\,mA$

$i_5 = -i_3 + i_1 = 2.06\,mA - 0{,}696\,mA = 1{,}364\,mA$

2. Mesh Analysis

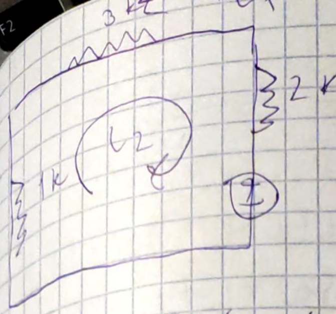


I loop



$-10 + 10k\,i_1 + 5k(i_1 - 5\,mA) + 3k(i_1 - i_2) = 0$

$18k\,i_1 - 3k\,i_2 = 35$



$1k \cdot i_2 + 3k(i_2 - i_1) + 2k(i_2 - 5mA) + 12 = 0$

$6k\,i_2 - 3k\,i_1 = -2$

$18k\,i_1 - 3k\,i_2 = 35$

$6k\,i_2 - 3k\,i_1 = -2$

$33k\,i_1 = 68$

$i_1 = 2.06\ mA \quad (i_{R4})$

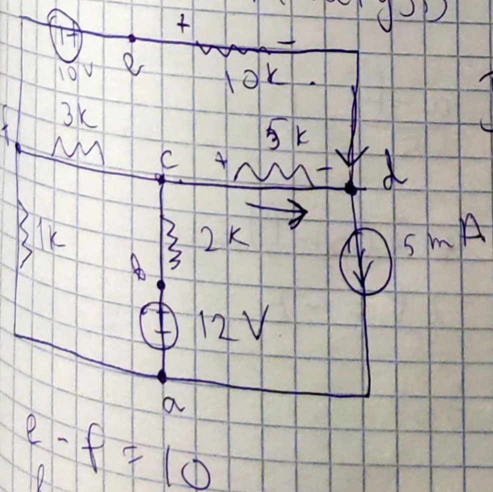
$i_2 = 0{,}696\ mA \quad (i_{R1})$

$i_{R5} = i_2 - i_1 = -1{,}364\ mA$

$i_{R2} = 5mA - i_2 = 4.304\ mA$

$i_{R3} = 5mA - i_1 = 2.94\ mA$

3. Nodal Analysis



I) node d.

$5mA = \frac{c-d}{5k} + \frac{e-d}{10k}$

$\frac{c-d}{2{,}5} + \frac{e-d}{5{,}0} = 1$

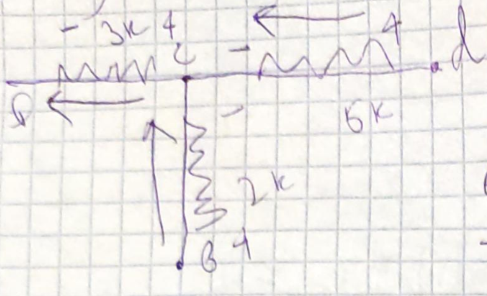
$2(c-d) + (10+f-d) = 50$

$2c - 3d + f = 40$

$e - f = 10$

$b - a = 12$

II) node c



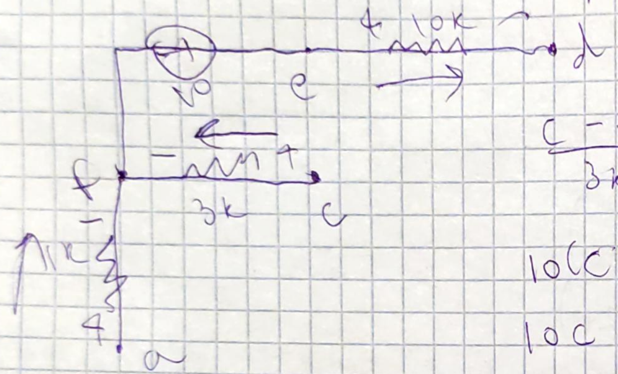
$$\frac{d-c}{5k} + \frac{b-c}{2k} = \frac{c-f}{3k}$$

$$6(d-c) + 15(12+a-c) = 10(c-f)$$

$$-31c + 6d + 15a + 10f = -180$$

$b - a = 12$

III) node f-e (supernode)



$$\frac{c-f}{3k} + \frac{a-f}{1k} = \frac{(10+f)-d}{10k}$$

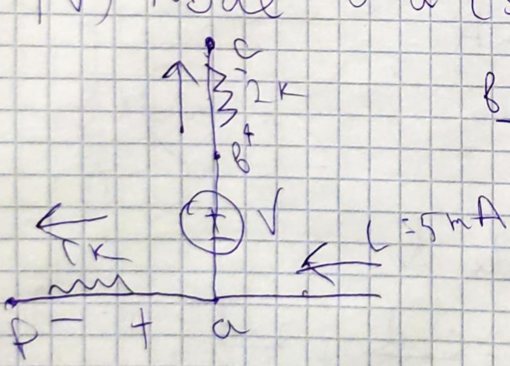
(e)

$$10(c-f) + 30(a-f) = 3(10+f-d)$$

$$10c - 43f + 3d + 30a = 30$$

$e - f = 10$

IV) node b-a (supernode)



$$\frac{b-c}{2k} + \frac{a-f}{1k} = 5mA$$

$$\frac{b-c}{10} + \frac{a-f}{5} = 1$$

$b = a + 12$

$$a + 12 - c + 2(a-f) = 10$$

$$3a - c - 2f = -2$$

V) solving linear equation

$2c - 3d + f = 40$

$-31c + 6d + 15a + 10f = -180$

$10c - 43f + 3d + 30a = 30$

$3a - \frac{2c}{2} - 2f = -2$

		-3	1	40
0	2	6	10	-180
15	-31	6	10	-180
30	10	3	-43	30
3	-1	0	-2	-2

1	$-\frac{31}{15}$	$-\frac{1}{2,5}$	$-\frac{2}{3}$	-12
0	2	-3	1	40
30	10	3	-4	30
3	-1	0	-2	-2

0	$-\frac{93}{15}+1$	$-\frac{1}{2,5}$	0	-34
0	2	-3	1	40
24	12	3	0	34
3	-1	0	-2	-2

0	2	-3	1	40
24	$13-\frac{93}{15}$	3,6	0	0
3	-1	0	-2	2

$2c = 3d - f + 40$

$\frac{102}{15} c = -24a + (-3,6)d$

$c = 3a - 2f - 2$

$6a - 4f - 4 = 3d - f + 40$

0	$-\frac{93}{15}$	$-\frac{1}{2,5}$	0	-34	
0	$\frac{2}{7,5}+\frac{93}{15}-1$	0	$\frac{1}{7,5}$	$\frac{40}{7,5}+34$	
$\frac{24}{7,5}$	$\frac{12}{7,5}-\frac{93}{15}+1$	0	0	$\frac{34}{7,5}-34$	
3	-1	0	-2	-2	

0	-93	-6	0	-510	
0	4 +93-15	0	2	80+510	
48	24 -93+15	0	0	68+510	
3	(-1+4+93-15)	0	0	78+510	

1	$-\frac{31}{15}+\frac{1}{2,5}+\frac{2}{3}$			-12
1	-1,5	+0,5	0	20
0	0	1	-1	$-\frac{350}{33}$

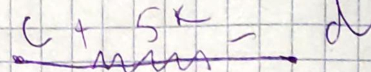
1	0	0	-1	$\frac{23}{33}$
0	1	0	-1	$\frac{45}{11}$
0	0	1	-1	$-\frac{350}{33}$

$a - f = \frac{23}{33}$

$c - f = \frac{45}{11}$

$d - f = -\frac{350}{33}$

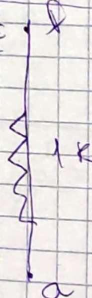
$c - d = \frac{485}{33}$



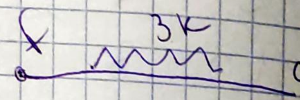
$I_{R_3} = \frac{485}{33 \cdot 5k} = 2{,}94 \text{ mA}$

$I_{R_1} = \frac{23}{33 \cdot 1k}$

$0{,}696 \text{ mA}$



I_{R_5}



$I_{R_5} = \frac{45}{11 \cdot 3k} = 1{,}364 \text{ mA}$

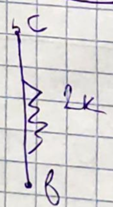
I_{R_2}

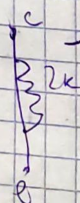
$b - a = 12$

$c - f = \frac{45}{11}$

$a - f = \frac{22}{33}$

$c - a = \frac{113}{33}$



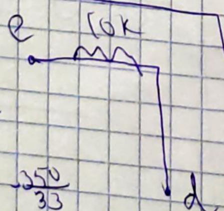


$b - a = 12$

$c - a = \frac{113}{33}$

$\frac{b - c}{2k} = \frac{12 - \frac{113}{33}}{2k} = 4{,}304 \text{ mA}$

I_{R_4}

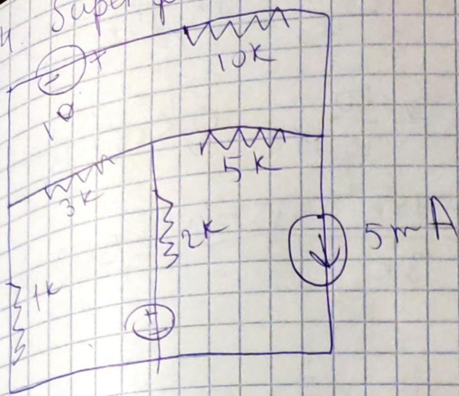


$d - f = -\frac{350}{33}$

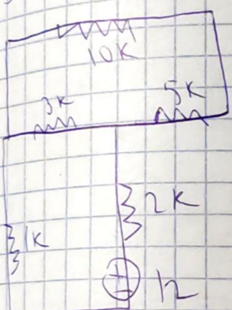
$d - e + 10 = -\frac{350}{33}$

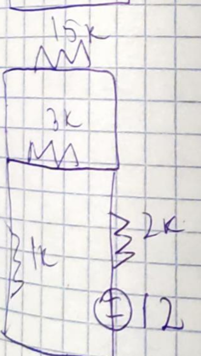
$I_{R_4} = \frac{-\frac{350}{33} - 10}{10k} = 2{,}06 \text{ mA}$

4. Superposition



I) Switching on V_3





$$V_{eq} = 1k + 2k + \frac{15k \cdot 3k}{18k} = 5,5k$$

$$I_{R_2} = I_{R_1} = \frac{12}{5,5k} = 2,18\,mA$$

$$I_{R_3} = I_{R_4} = \frac{12 - 3 \cdot 2,18\,mA}{15k} = 0,364\,mA$$

$$I_{R_5} = \frac{12 - 3 \cdot 2,18}{3k} = 1,82\,mA$$

II) Switching on V_2 6

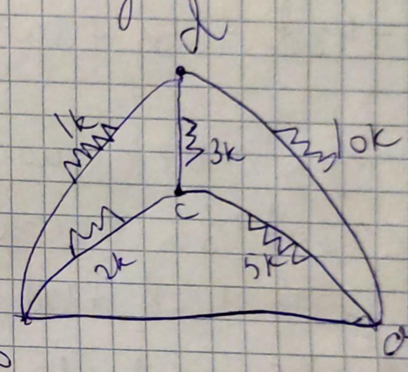
$R_{eq} = 15k + \frac{3k\,3k}{6k} = 1,5k + 15k = 16,5k$

$I_{R_3} = I_{R_4} = 0,606\ mA$

$I_{R5=R2=R1} = 0,303\ mA = \frac{0,606\,mA}{2}$

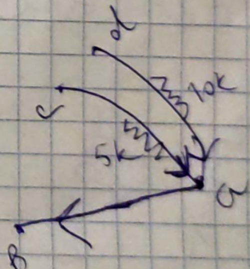
III) Switching on I_1

Redrawing



Need to solve it by Nodal analysis

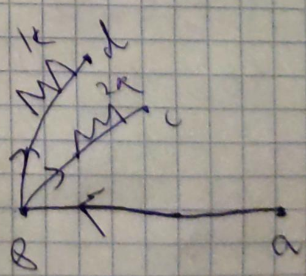
I) node a



$\frac{d-a}{10k} + \frac{c-a}{5k} = 5\,mA$

$-3a + 2c + d = 50$

II) node b



$\frac{b-c}{2k} + \frac{b-d}{1k} = 5\,mA$

$3b - c - 2d = 10$

III node c

$$\frac{d-c}{3k} + \frac{b-c}{2k} = \frac{c-a}{5k}$$

$$6a - 31c + 15b + 10d = 0$$

IV) node d

$$\frac{b-d}{1k} = \frac{d-a}{10k} + \frac{d-c}{3k}$$

$$-43d + 30b + 3a + 10c = 0$$

V) Solving the linear equation

$$-43d + 30b + 3a + 10c = 0$$
$$6a - 31c + 15b + 10d = 0$$
$$3b - \frac{3c}{3} - 2d = 10$$
$$-3a + 2c + d = 50$$

$$\begin{matrix} 1 & 0 & -\frac{2}{3} & -\frac{1}{3} & -\frac{50}{3} \\ 0 & 3 & -1 & -2 & 10 \\ 6 & 15 & -31 & 10 & 0 \\ 3 & 30 & 10 & -43 & 0 \end{matrix}$$

$$\begin{matrix} 1 & 0 & -\frac{2}{3} & -\frac{1}{3} & -\frac{50}{3} \\ 0 & 1 & -\frac{1}{3} & -\frac{2}{3} & \frac{10}{3} \\ 0 & 0 & -22 & 22 & 50 \\ 0 & 0 & 22 & -22 & -50 \end{matrix}$$

$$\begin{matrix} 1 & 0 & -\frac{2}{3} & -\frac{1}{3} & -\frac{50}{3} \\ 0 & 3 & -1 & -2 & 10 \\ 0 & 15 & -27 & 12 & 100 \\ 0 & 30 & 12 & -42 & 150 \end{matrix}$$

$$\begin{matrix} 1 & 0 & \frac{2}{3} & \frac{1}{3} & -\frac{50}{3} \\ 0 & 1 & -\frac{1}{3} & -\frac{2}{3} & \frac{10}{3} \\ 0 & 0 & 1 & -1 & -\frac{25}{11} \end{matrix}$$

$a - d = -\frac{200}{11}$

$b - d = \frac{85}{33}$

$c - d = -\frac{25}{11}$

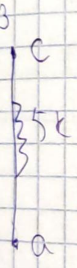
I_{R4}

$a - d = -\frac{200}{11}$

$d - a = \frac{200}{11}$

$I_{R4} = \frac{200}{11 \cdot 10k} = 1,82\ mA$

I_{R3}



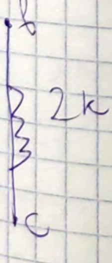
$a - d = -\frac{200}{11}$

$c - d = -\frac{25}{11}$

$c - a = -\frac{25}{11} + \frac{200}{11} = \frac{175}{11}$

$I_{R3} = \frac{175}{11 \cdot 5k} = 3,18\ mA$

I_{R2}



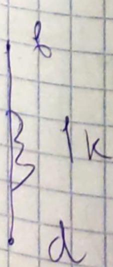
$b - d = \frac{85}{33}$

$c - d = -\frac{25}{11}$

$b - c = \frac{160}{33}$

$I_{R2} = \frac{160}{33 \cdot 2k} = \cancel{1,67\ mA}$ $2,42\ mA$

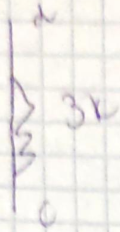
I_{R1}



$b - d = \frac{85}{33}$

$I_{R1} = \frac{85}{33 \cdot 1k} = 2,57\ mA$

$I_{R_5} =$

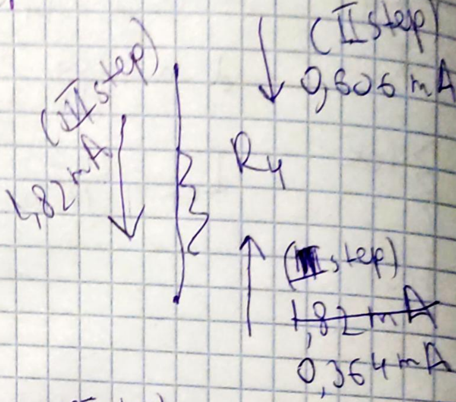


$d - c = \frac{25}{11}$

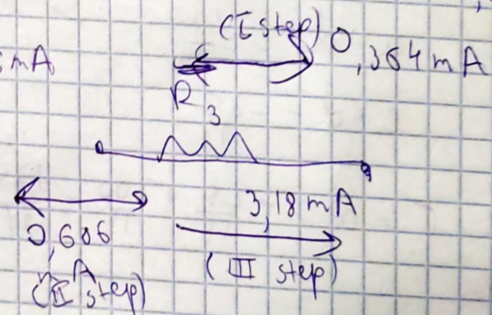
$I_{R_5} = \frac{25}{11 \cdot 3k} = 0{,}757 \text{ mA}$

IV) Superposition princ.

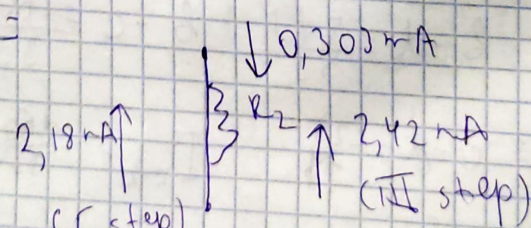
$I_{R_4} = 1{,}82 \text{ mA} + 0{,}606 \text{ mA}$
$- 0{,}364 \text{ mA} =$
$2{,}062 \text{ mA}$



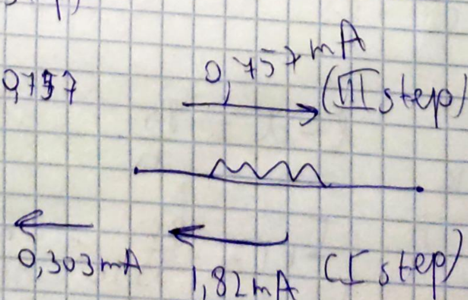
$I_{R_3} = 3{,}18 \text{ mA} - 0{,}606 \text{ mA}$
$+ 0{,}364 \text{ mA} =$
$2{,}938 \text{ mA}$



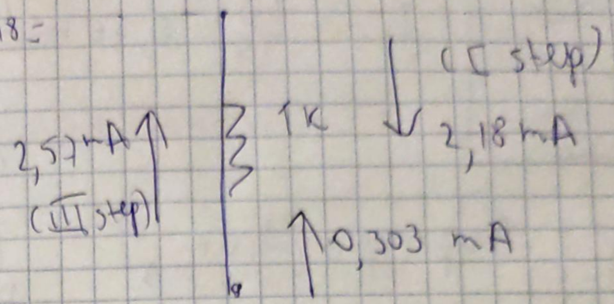
$I_{R_2} =$
$2{,}42 + 2{,}18 - 0{,}303 =$
$4{,}297 \text{ mA}$



$I_{R_5} = 1{,}82 \text{ mA} + 0{,}303 - 0{,}757$
$= 1{,}366 \text{ mA}$

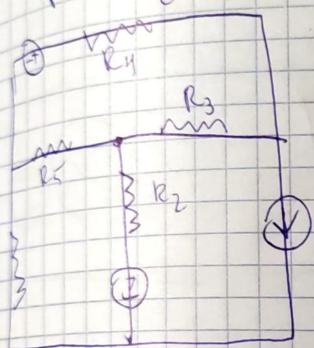


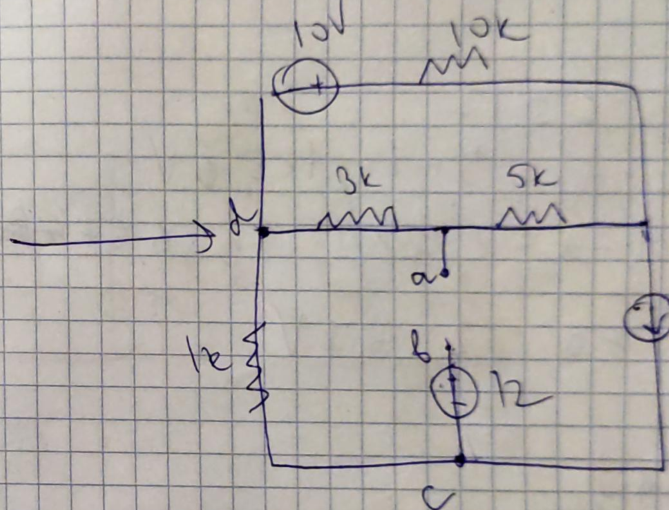
$I_{R1} = 2{,}57 + 0{,}303 - 2{,}18 =$
$0{,}693 \text{ mA}$



5. Thevenin method

finding I_{R_2}



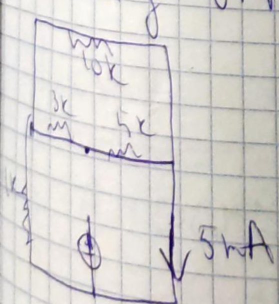


1) Finding V_{th}

I) Finding V_{d-c}

by super position

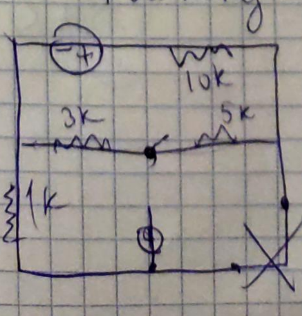
Turning off V_2



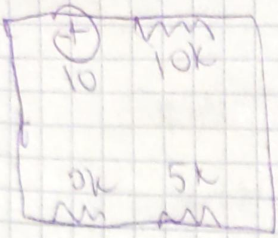
As we can observe,

$I_{R1} = 5 \text{ mA}$ $\quad I_{R5} = \frac{10}{18} \cdot 5\text{mA} = 2{,}78 \text{ mA}$

Turning off current source



$I'_{R_1} = 0 \text{ mA}$

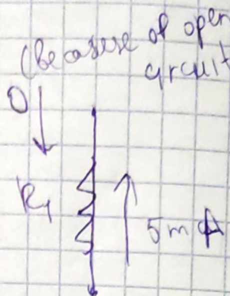


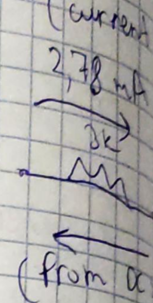
$I_{R5} = \frac{10}{18} = 0{,}56\ mA$

By superposition,

$I_{R1} = 5mA - 0 = 5mA$

$I_{R5} = 2{,}78 - 0{,}56 = 2{,}22\ mA$





b

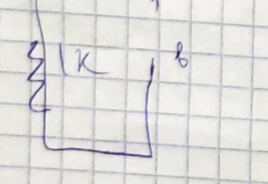
$+ \quad c = 12$

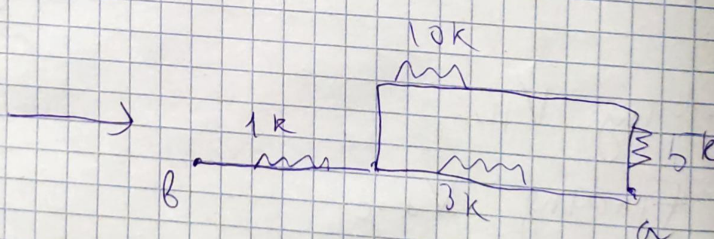
$+ \quad c - d = 5mA \cdot 1k = 5V$

$+ \quad d - a = 2{,}22mA \cdot 3k = 6{,}67\ \cancel{mA}\ V$

$V_{th} = b - a = 23{,}67V$

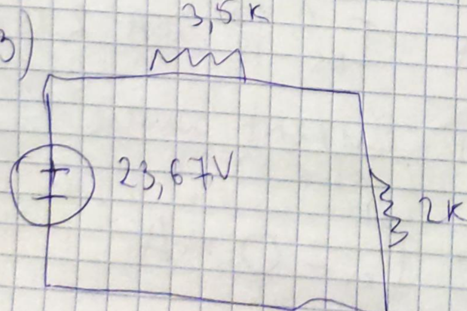
2) R_{th}





$R_{th} = 1k + \frac{15k \cdot 3k}{18k} = 3{,}5k$

3)

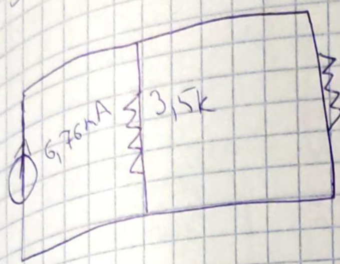


$I_{R2} = \frac{23{,}67}{5{,}5k} = 4{,}303\ mA$

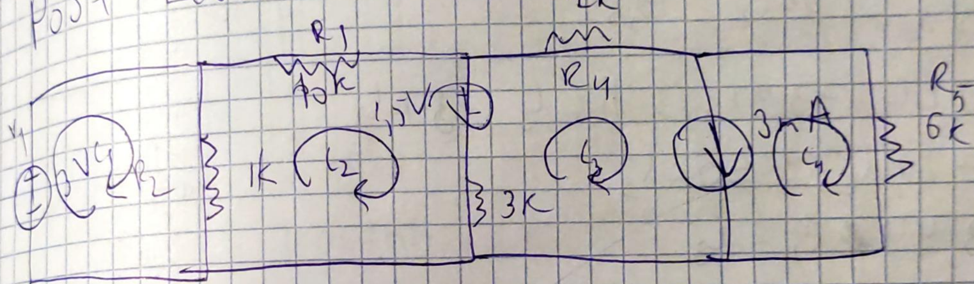
6. Norton's theorem

$$I_N = \frac{V_{th}}{R_{th}} = \frac{23{,}67}{3{,}5k} = 6{,}76\,mA$$

$$I_{R_2} = \frac{3{,}5}{5{,}5} \cdot 6{,}76\,mA = 4{,}302\,mA$$

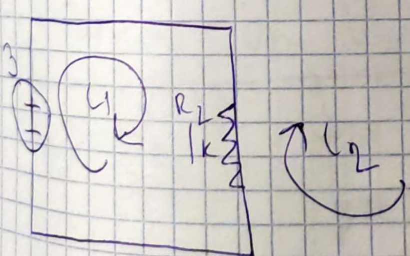


Post Lab



1) Mesh Analysis

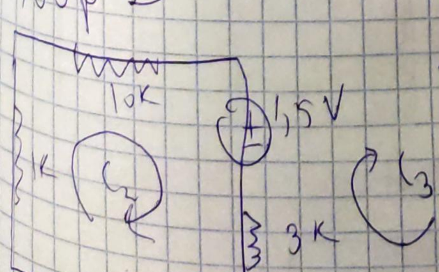
loop 1



$$-3 + 1k\,(i_1 - i_2) = 0$$

$$i_1 - i_2 = 3\,mA$$

loop 2



$$10k\,i_2 + 1{,}5 + 3k\,(i_2 - i_3) + 1k\,(i_2 - i_1) = 0$$

$$13k\,i_2 + 1{,}5 - 3k\,i_3 + 1k\,(-3\,mA) = 0$$

$$13k\,i_2 - 3k\,i_3 = 1{,}5$$

loop 3

$3k(i_3-i_2)-1{,}5+2k\cdot i_3+6k\,i_4=0$

$11k\,i_3-3k\,i_3-19{,}5=0$

$3mA\ i_4=i_3$

$i_4=i_3-3mA$

$13k\,i_2-3k\,i_3=1{,}5 \quad |\cdot 13$

$11k\,i_3-3k\,i_2=19{,}5$

$169k\,i_2-39k\,i_3=11k\,i_3-3k\,i_2$

$172k\,i_2=50k\,i_3$

$3{,}44\,i_2=i_3$

$13k\,i_2-3k\cdot 3{,}44\,i_2=1{,}5$

$i_2=\dfrac{1{,}5}{13k-3k\cdot 3{,}44}=0{,}559\,mA$

$i_3=3{,}44\cdot 0{,}559\,mA=1{,}925\,mA$

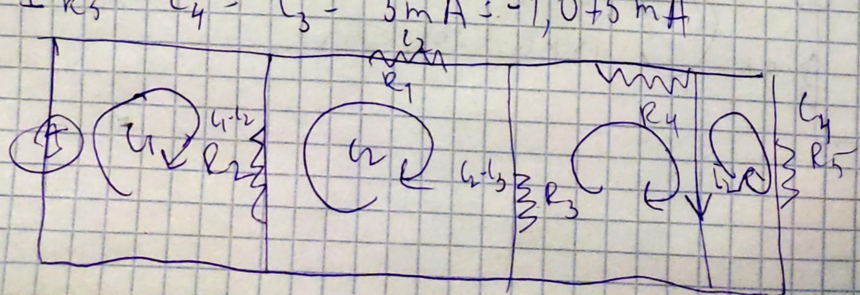
$I_{R1}=i_2=0{,}559\,mA$

$I_{R4}=i_3=1{,}925\,mA$

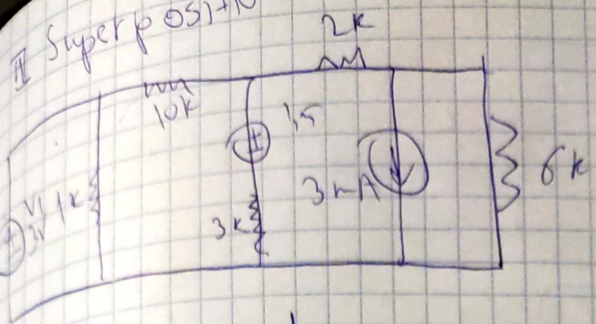
$I_{R3}=i_2-i_3=-1{,}366\,mA$

$I_{R2}=i_1-i_2=3\,mA$

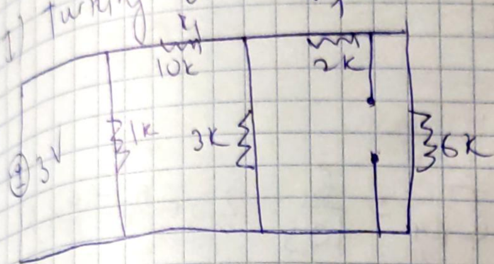
$I_{R5}=i_4=i_3-3mA=-1{,}075\,mA$



IV Superposition



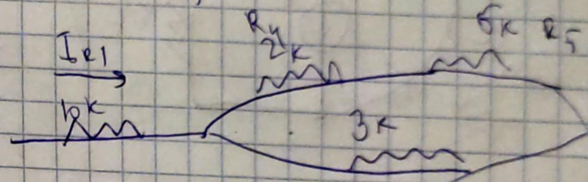
I) Turning on V_1



$R_{eq}(\text{right side}) = 10k + \frac{8k \cdot 3k}{11k} =$

$12{,}18\,k$

$I_{R_1} = \frac{3}{12{,}18k} = 0{,}246\ mA$



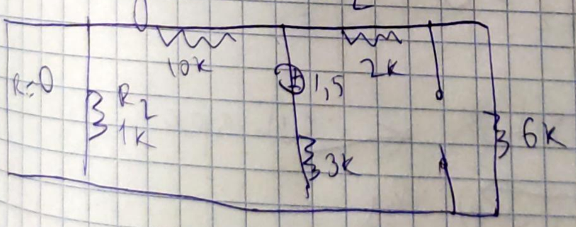
$I_{R4} = I_{R5} = \frac{3}{11} \cdot 0{,}246 =$

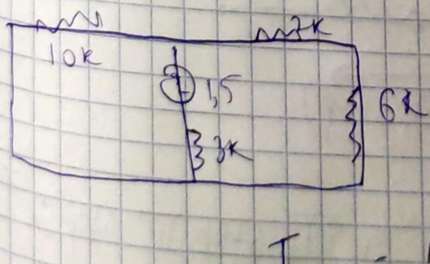
$0{,}067\,mA$

$I_{R3} = 0{,}179\ mA$

$I_{R2} = \frac{3}{1k} = 3\,mA$

II Turning on V_2





$R_{eq} = 3k + \frac{10k \cdot 8k}{18k} = 4{,}44k + 3k =$

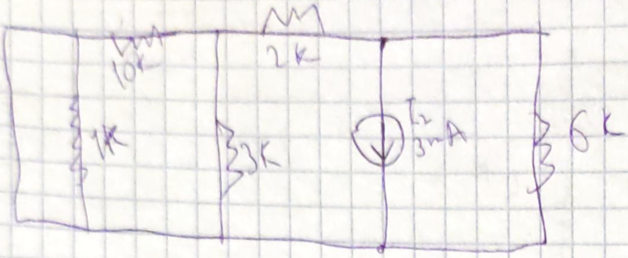
$7{,}44\,k$

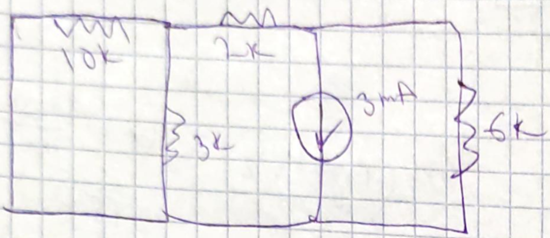
$I_{R3} = \frac{1{,}5\,V}{7{,}44\,k} = 0{,}2 \cdot 10^{-3}\,A$

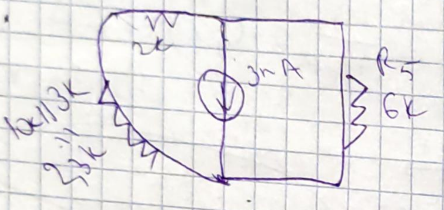
$V = 0{,}9\,V = 1{,}5 - 0{,}2\,mA \cdot 3\,k$

$I_{R4} = I_{R5} = \frac{0{,}9\,m}{8\,k} = 0{,}1125\,mA$ $\quad I_{R1} = \frac{0{,}9}{10k} = 0{,}09\,mA$

III) Turning on I_2

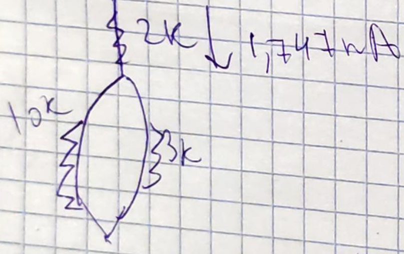






$$I_{R4} = \frac{6}{10,3}\cdot 2,3\,mA = 1,747\,mA$$

$$I_{R5} = \frac{4,3}{10,3}\cdot \cancel{2,}3\,mA = 1,25\,mA$$



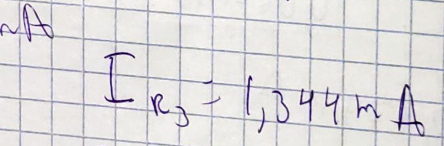
$$I_{R_3} = 1,344\,mA$$

$$I_{R_1} = 0,403\,mA$$

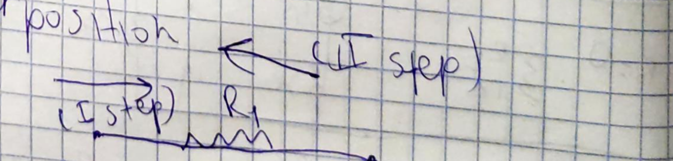
$$I_{R_2} = 0$$

IV) Applying Superposition

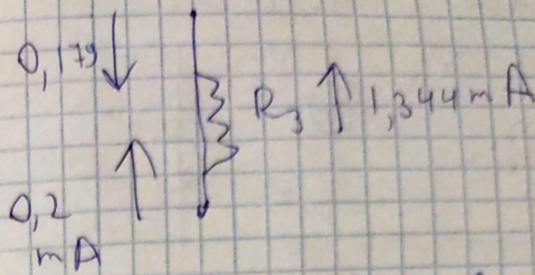
$$I_{R_1} = 0,403 + 0,246 - 0,09 = 0,559\,mA$$



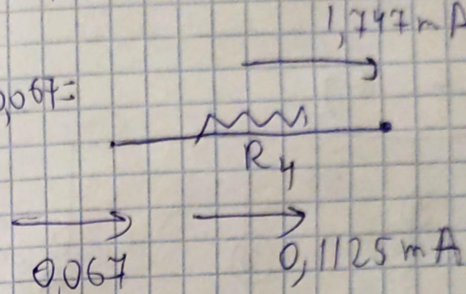
$$I_{R_2} = 3\,mA$$



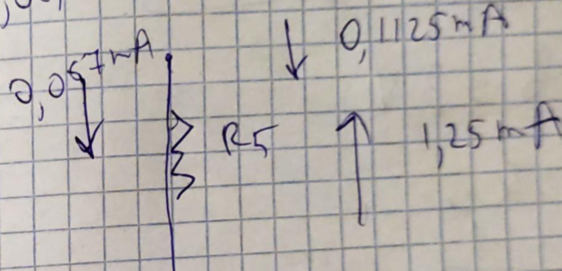
$I_{R3} = 1,344 + 0,2 - 0,179 =$
$1,365 \text{ mA}$



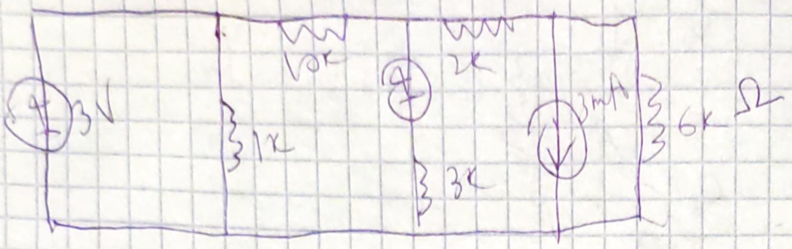
$I_{R4} = 1,747 + 0,1125 + 0,067 =$
$1,939 \text{ mA}$



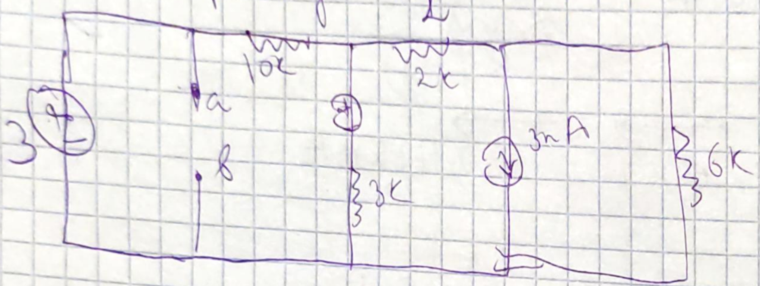
$I_{R5} = 1,25 - 0,1125 - 0,067$
$1,071 \text{ mA}$



Norton's theorem

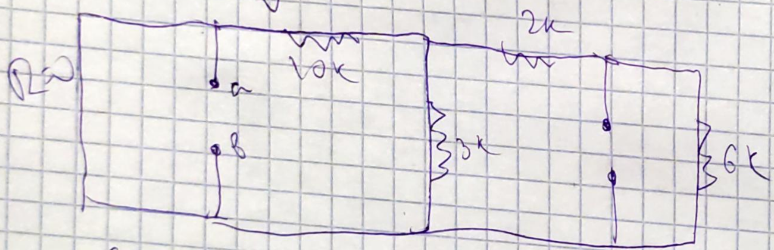


I) Opening R_2



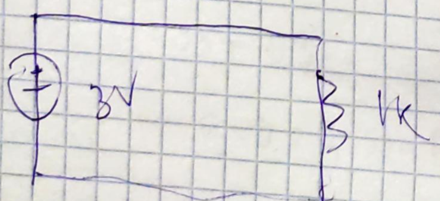
$V_{th} = a - b = 3V$

finding R_{th}



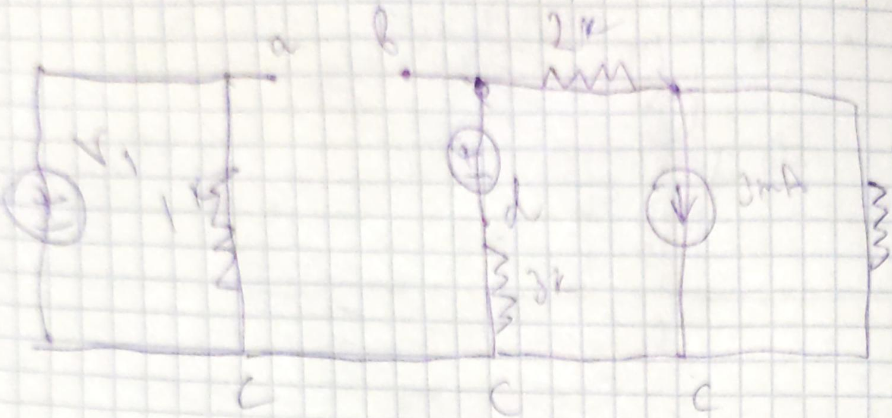
Since $R_{Left} = 0$

$R_{eq} = 0.$



$I_{R_1} = 3mA$

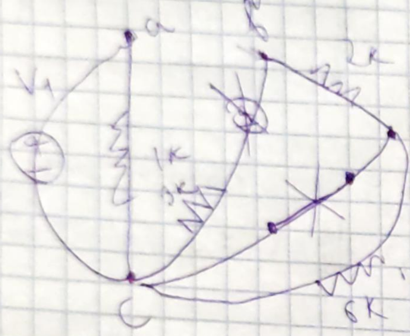
II Opening R_1 and finding curren I_{R1}



a-c
c-d
d-b = -
we need
$I_{R2} = ?$
$I_{R3} = ?$

We will superposition pr. here

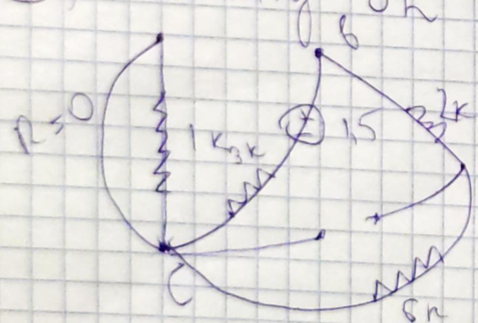
I) Leaving V_1 turned on

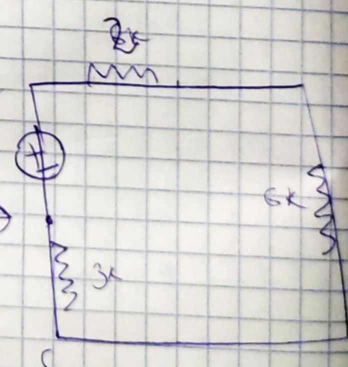


$I_{R2} = 3\,mA$

Other current values 0

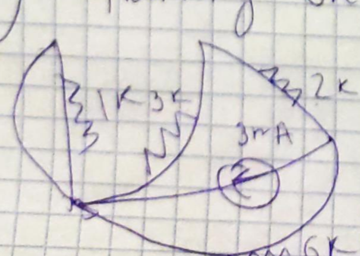
II) Turning on V_2





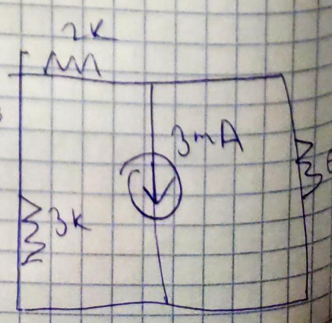
$I_{R2} = 0$ $\quad I_{R3} = \frac{1,5}{11\,k} = 0,136\,mA$

III) Turning on I_2



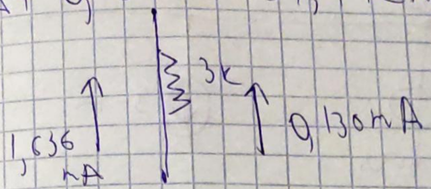
$I_{R3} = \frac{6}{11} \cdot 3\,mA =$

$1,636\,mA$



$I_{R2} = 3\,mA$

$I_{R3} = 1{,}636\,mA + 0{,}136\,mA = 1{,}772\,mA$



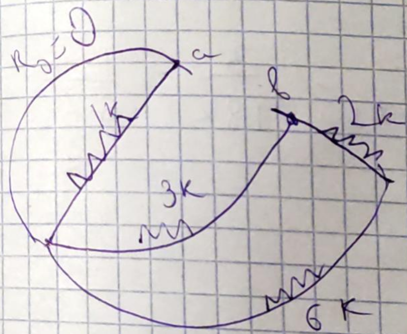
$a-c = I_{R2} \cdot R_2 = 3V$

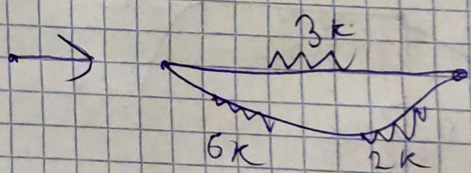
$+\ c-d = I_{R3} \cdot R_3 = 1{,}772\,mA \cdot 3k = 5{,}316\,V$

$+\ d-B = -1{,}5$

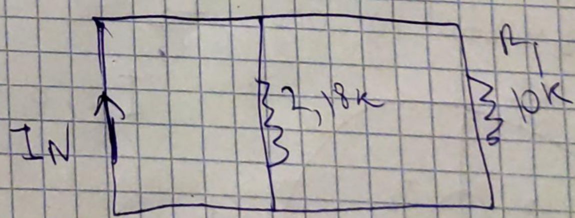
$V_{th} = a-B = 8{,}316 - 1{,}5 = 6{,}816\,V$

$R_{th} = \frac{3k \cdot 8k}{11k} = 2{,}18\,k$



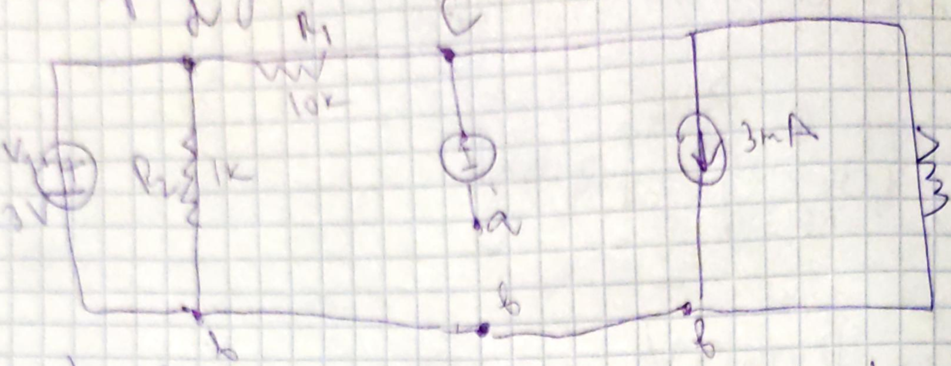


$I_N = 3{,}127\,mA$



$I_{R1} = \frac{2{,}18k}{12{,}18k} \cdot 3{,}127\,mA = 0{,}559\,mA$

Opening R_3



1) V_{th} , so we need to find I_{R_2} and I_{R_1}

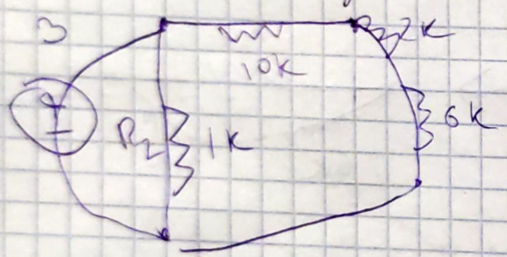
$C-a = 1,5V$

$d-c =$

$d-b = 3V$ $I_{R_2} = 3mA$

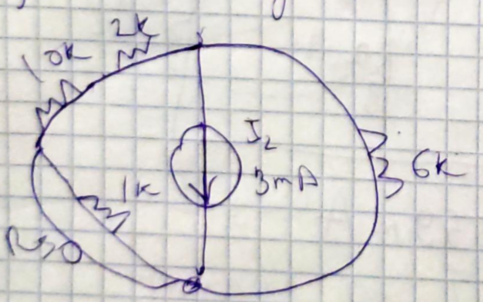
Appying superposition pr.

1) Switching on V_1

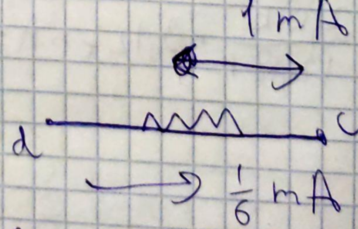


$I_{R_1} = \frac{3}{18k} = \frac{1}{6k}$

2) Switching on I_2



$I_{R_1} = \frac{6k}{18k} \cdot 3mA = 1mA$



$I_{R_1} = \frac{7}{6} mA$

$d-c = 10k \cdot \frac{7}{6} mA = \frac{70}{6}$ ~~mA~~ V

$+ \; c-a = 1,5 V$

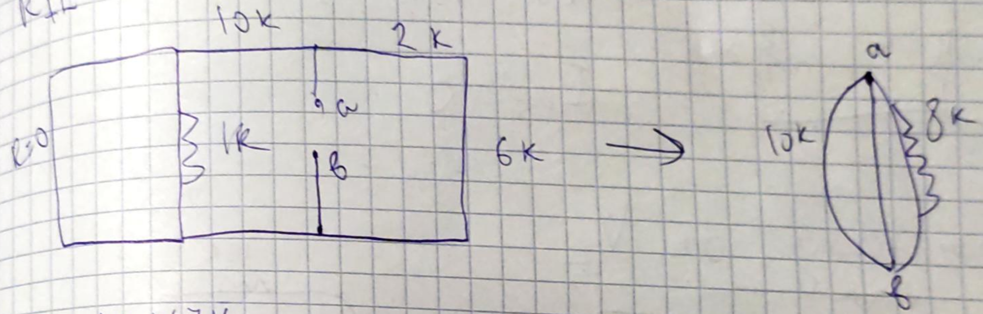
$d-b = 3$

$d-a = 13,167 V$

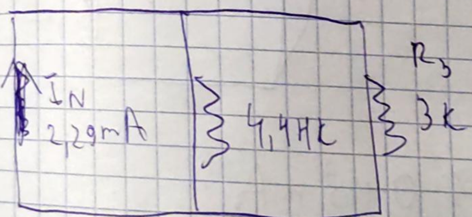
$- \; d-b = 3 V$

$V_{th} = b-a = 10,167 V$

$R_{th} = \frac{10k \cdot 8k}{18k} = \frac{80kk}{18k} = 4,44k$

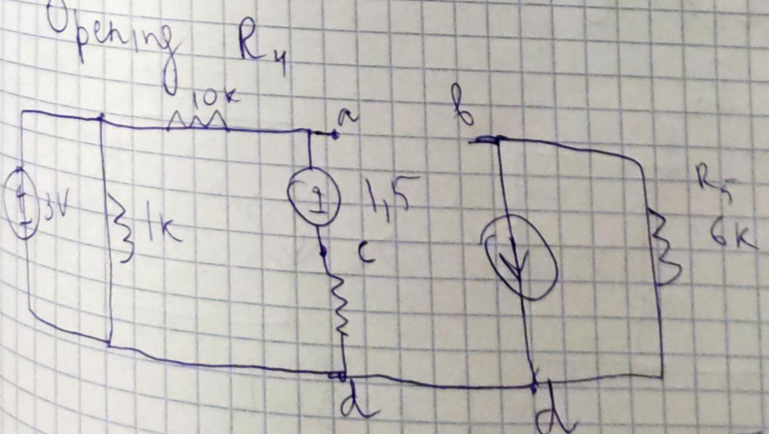


$I_N = \frac{10,167 V}{4,44k} = 2,29 mA$



$I_{R3} = \frac{4,44}{7,44} \cdot 2,29 = 1,366 mA$

Opening R_4



To find

V_{th}

a-c = 1,5V

c-d =

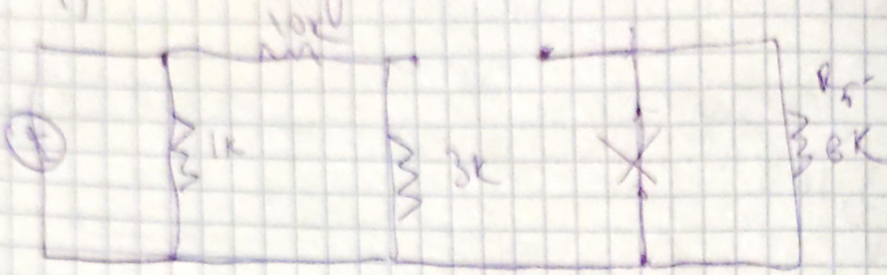
d-b =

I_{R3} =

I_{R5} =

Again, Applying superposition

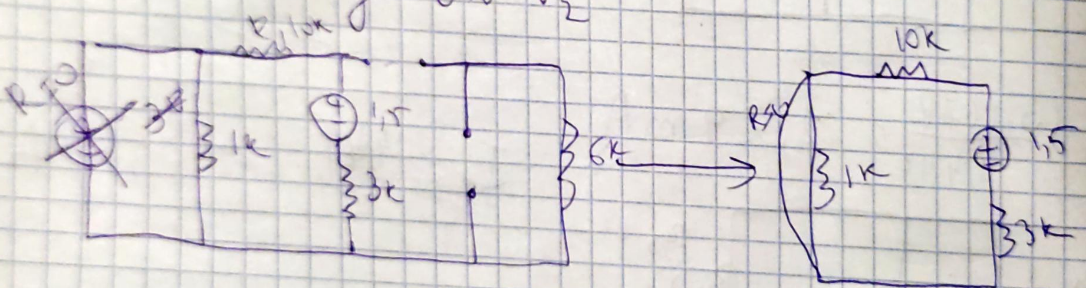
1) Switching on V_1



$I_{R3} = \frac{3}{13k} = 0{,}23\ mA$

$I_{R5} = 0$

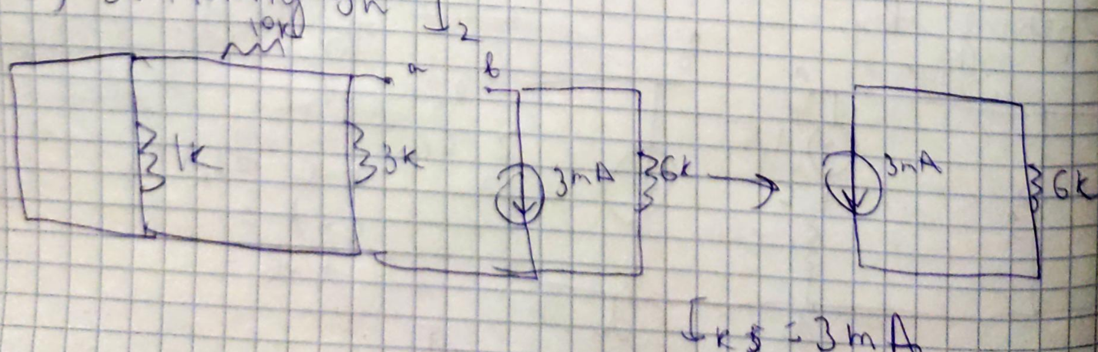
2) Switching on V_2



$I_{R3} = \frac{1{,}5}{13k} = 0{,}115\ mA$

$I_{R5} = 0$

3) Switching on I_2

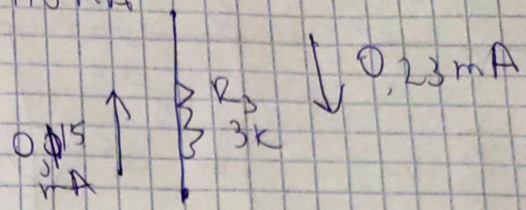


$I_{R5} = 3\ mA$

$I_{R3} = 0$

$I_{R3} = 0,23 - 0,115 = 0,115\ mA$

$I_{R5} = 3\ mA$



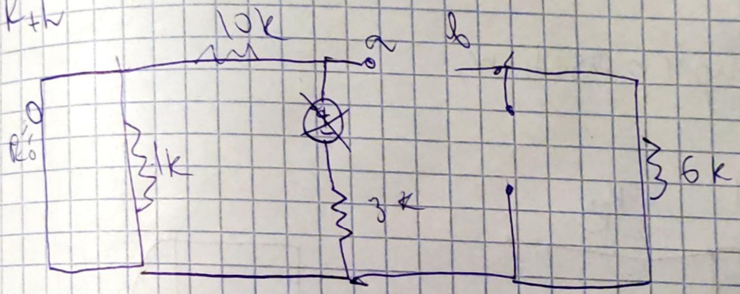
$a - c = 1,5$

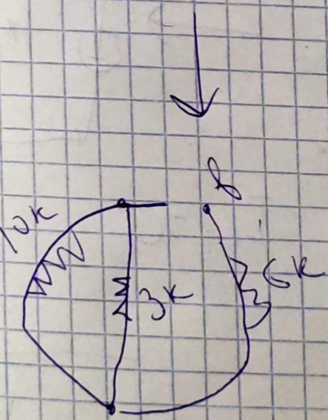
$+\ c - d = 0,115\ mA \cdot 3k = 0,345\ V$

$+\ d - b = 3\ mA \cdot 6k = 18\ V$

$V_{th} = a - b = 19,845\ V$

R_{th}



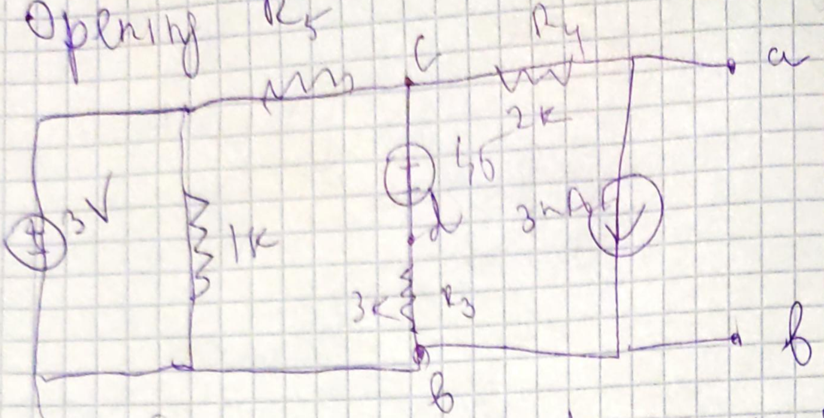


$R_{eq} = \frac{10 \cdot 3k\,k}{13k} + 6k = 8,3k$

$I_N = \frac{19,845}{8,3k} = 2,39\ mA$

$I_{R4} = \frac{8,3k}{10,3k} \cdot 2,39\ mA = 1,926\ mA$

Opening R_5



To find V_{th} and we need I_{R_4} and I_{R_3}

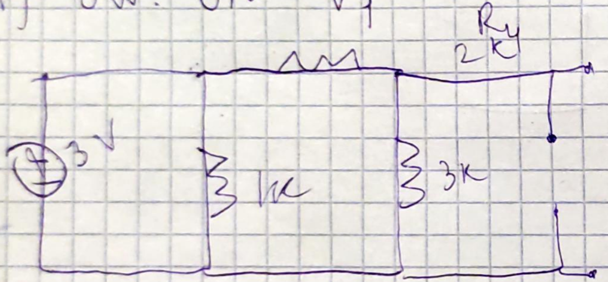
a - c =

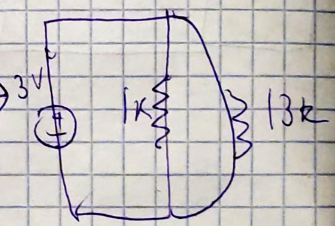
c - d = 1,5

d - b =

Applying Superposition

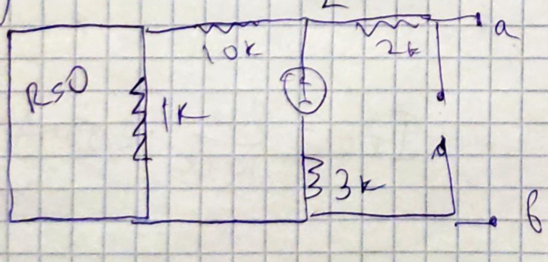
1) SW. on V_1

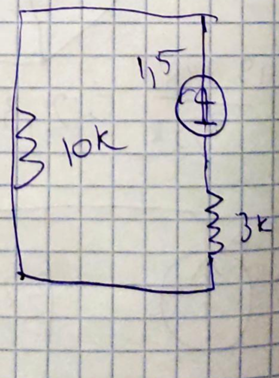




$I_{R_3} = \frac{3}{13k} = 0,23$ mA $\quad I_{R_4} = 0$

2) SW. on V_2

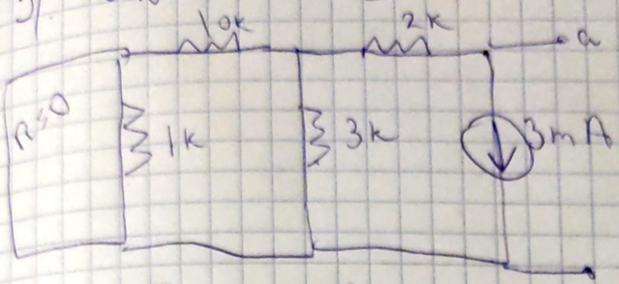


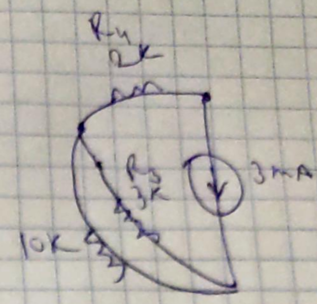


$I_{R_3} = \frac{1,5}{13,k} = 0,115$ mA

$I_{R_4} = 0$

3/ Sw. on I_2



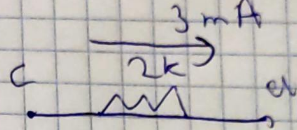


$I_{R_4} = 3\,mA$

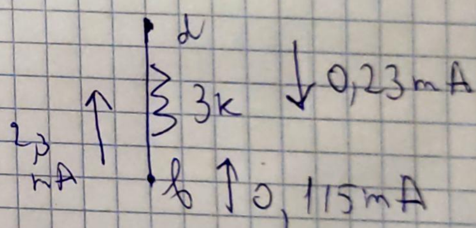
$I_{R_3} = \frac{10}{13}\cdot 3\,mA = 2,3\,mA$

App. Superp.

$I_{R_4} = 3\,mA$



$I_{R_3} = 2,3 + 0,115 - 0,23 =$
$2,185\,mA$



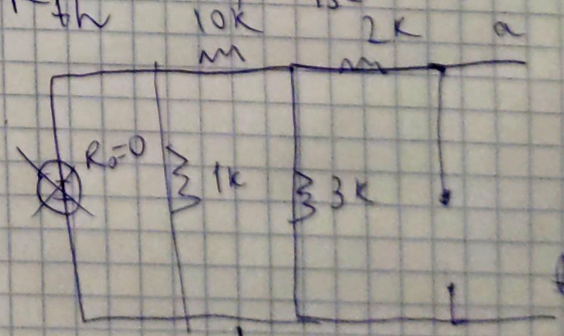
$a - c = -2k\cdot 3mA = -6V$

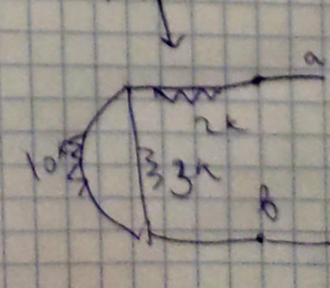
$+\ d - b = -2,185mA\cdot 3k = -6,555\ \cancel{mA}\,V$

$+\ c - d = 1,5V$

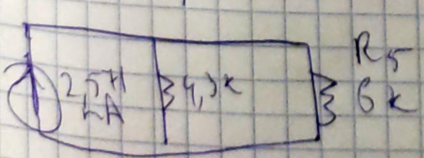
$V_{4L} = a - b = -11,055\,V$

$R_{th} = 2 + \frac{10\cdot 3kk}{13k} = 2,3\,k + 2 = 4,3\,k$





$I_N = \frac{11,055}{4,3k} = 2,571\,mA$



$I_{R_5} = \frac{4,3}{10,3}\cdot 2,571 = 1,073\,mA$