Section 2B1

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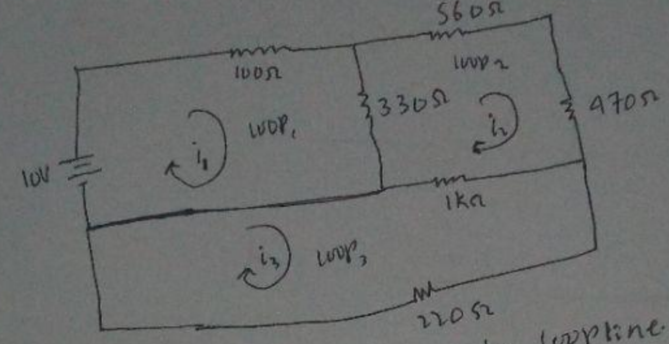
DATE OF SUBMITION AUG 24/2021

2.1 For the circuit of the figure-10 find the current in each element and voltage across each element. Show Kirchoff's law are satisfied.




By Appliyng mesh analysis for loopline.

for mesh 1 (loop 1) KVL

$-10V + 100i_1 + 330(i_1 - i_2) = 0$

$430i_1 - 330i_2 = 10V$ ---- equation (*)

for mesh 2 (loop-2) KVL

$560i_2 + 470i_2 + 330(i_2 - i_1) + 1000(i_2 - i_3) = 0$

$2360i_2 - 330i_1 - 1000i_3 = 0$ ----- equation (**)

for mesh 3 (loop-3) KVL

$220i_3 + 1000(i_3 - i_2) = 0$

$1220i_3 - 1000i_2 = 0$ ---- equation (***)

by solving the above three system of equation.

$1220i_3 - 1000i_2 = 0$

$2360i_2 - 330i_1 - 1000i_3 = 0$

$2.8792\times10^6 i_2 - 4.02\times10^5 i_1 - 1\times10^6 i_2 = 0$

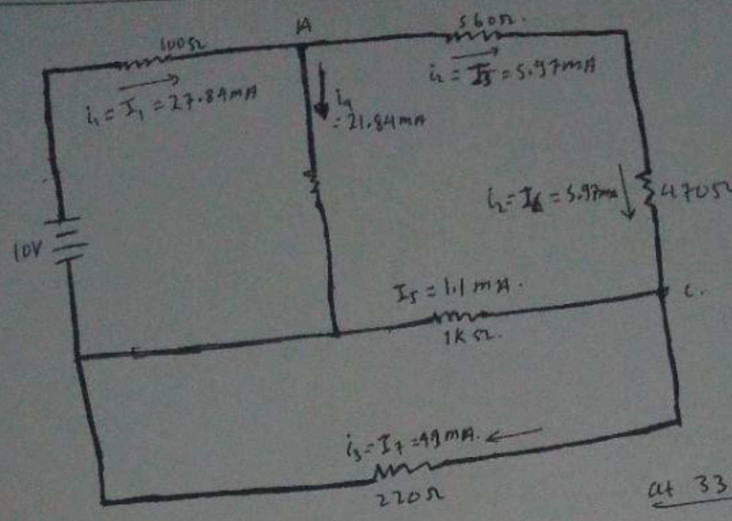
$1.8792\times10^6 i_2 - 4.02\times10^5 i_1 = 0$

$430i_2 - 330i_2 = 10V$

$i_1 = 27.84 mA$

$i_2 = 5.98 mA$

$i_3 = 4.9 mA.$




at node A

$I_4 = i_1 - i_2 = \underline{21.87mA}$

KCL at node C

$I_5 = i_2 - i_1 = 1.1mA$

$I_3 = i_2 = 5.97mA$

$I_1 = i_1 = 27.84mA$

$I_6 = i_2 = 5.97mA$

$I_7 = i_3 = 4.9mA.$

The voltage drop at

<u>100Ω Resistor</u> $V_1 = i_1 R_1 = 27.84 \times 100\Omega$

$V_1 = \underline{2.78V}$

<u>at 560Ω Resistor</u> $V_2 = i_2 R_2 = 5.97 mA \times 560\Omega$

$= \underline{3.34}V$

<u>at 220Ω</u> $V_3 = i_3 R_3 = 4.9mA \times 220\Omega$

$= \underline{1.1V}$

<u>at 330Ω</u> Resistance $V_4 = i_4 \times R_4$

$V_4 = 21.87mA \times 330\Omega$

$= \underline{7.22}V$

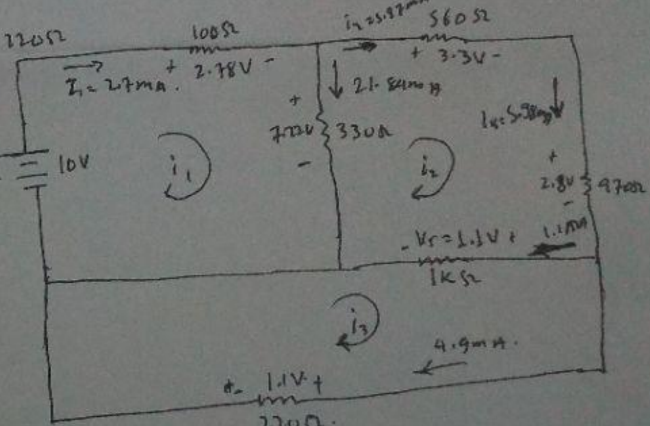
at 1KΩ Resistor $V_5 = i_5 R_5$

$V_5 = 1.1mA \times 1000\Omega$

$V_5 = \underline{1.1V}$

~~at 330~~

let's check for the Kirchoff's law




KCL at node A i.e.

$i_1 = i_2 + I_4$

$27.84mA = 21.87mA + 5.97mA$

$27.84mA \simeq 27.84mA.$

KCL at node C

$i_2 = I_5 + I_3 = 5.97 mA = 5.97mA$

KVL at each mesh is also satisfied

<u>KVL mesh 1</u> $-10V + 7.22V + 2.78V = 0$

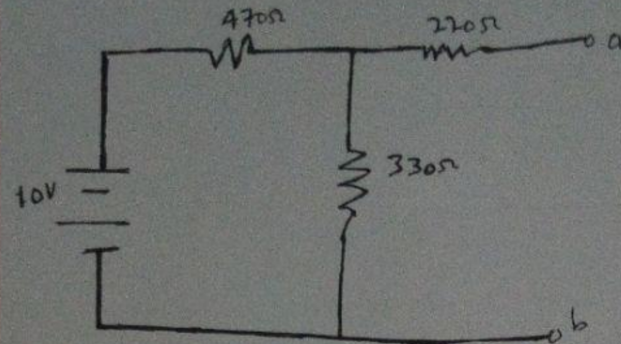
<u>KVL at mesh 2</u>

$-7.22V + 2.81V + 1.1V + 3.34V = 0$

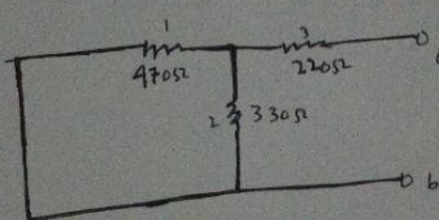
<u>KVL at mesh 3</u>

$1.1V - 1.1V = 0$

2.2: For the circuit of figure-11, find the Thevenin's equivalent circuit across terminals a-b.



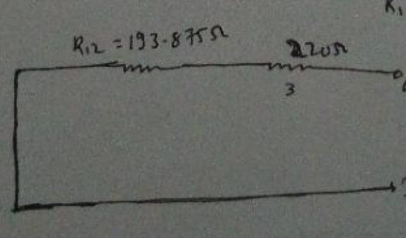

Let us find $R_{Th}$ to find $R_{Th}$ we could turnoff the voltage Source.




Resistors 470Ω and 330Ω are in parallel so we can find their equivalent resistor by

$$R_{12} = \frac{R_1 \times R_2}{R_1 + R_2} = \frac{330\Omega \times 470\Omega}{330\Omega + 470\Omega}$$

$$R_{12} = \frac{155100\Omega}{800\Omega} = \underline{193.875\Omega}$$



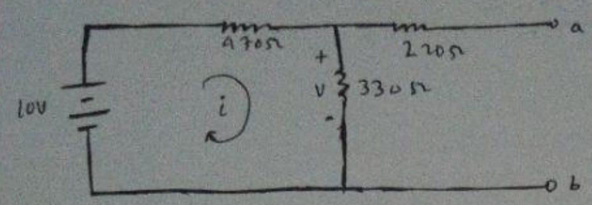

Now $R_{12}$ and $R_3$ are in series we can find their equivalent Resistor by $R_{123} = R_{12} + R_3$

$$R_{123} = 193.875\Omega + 220\Omega = \underline{\underline{413.875\Omega}}$$

Since $R_{Th} = R_{equivalent} = R_{123}$ $R_{Th} = \underline{413.875\Omega}$

Let us find the Thevenin's voltage. to find $V_{Th}$.

~~le~~ we can use mesh anarisis.




The Resistor 220Ω is not transfer current or the current is not pass through because at terminal a and b there is no closed system.

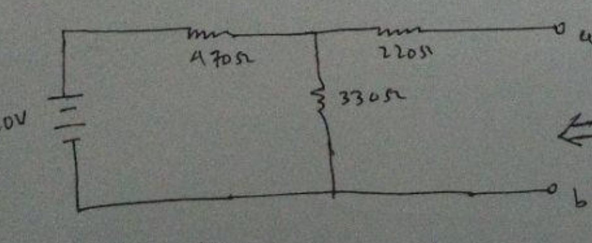
Therefore the only terminal Resistor which carry current is the 330Ω Resistor.

$$-10V + 470\Omega\, i + 330\Omega\, i = 0$$

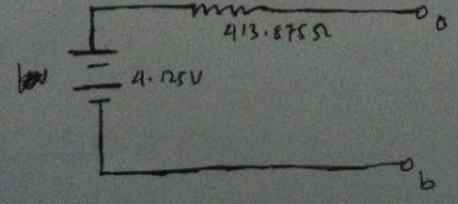
$$800\Omega i = 10V$$

$$i = \frac{1}{80} A$$

$$V_{Th} = (330\Omega)\left(\frac{1}{80} A\right) = 4.125V$$




$\Longleftrightarrow$ become Thevenin's equivalent.



THANK YOU!!