

VERIFICATION OF KIRCHOFF'S CURRENT LAW AND KIRCHOFF'S VOLTAGE LAW

Exp no - 1

Name - Aadil Mohamed Puthiyaveetil

Reg no - 22BCE2436

Date -

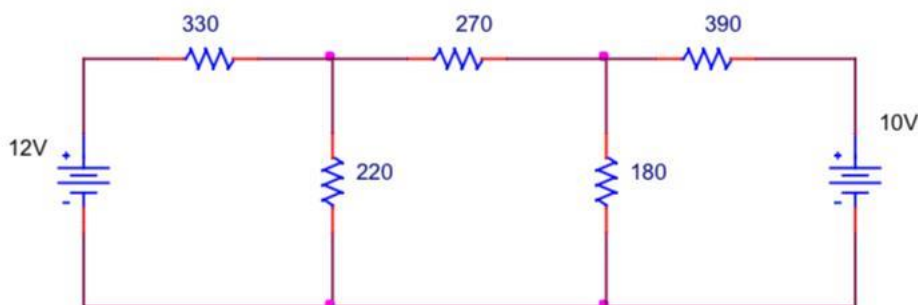
AIM :

- 1) To calculate the voltage and current for the given network using KVL and KCL respectively.
- 2) To verify the obtained values using orcad software

PROBLEM STATEMENT:

- 1) Calculate V_1 , V_2 and V_3 using nodal method.
- 2) Calculate I_1 , I_2 and I_3 using mesh method.

CIRCUIT DIAGRAM:



MANUAL CALCULATION :

Expt. No. _____ Date _____
Page No. _____

Nodal Method.

$$-\left(\frac{V_1 - 12 - 0}{330}\right) - \left(\frac{V_1 - 0}{220}\right) - \left(\frac{V_1 - V_2}{270}\right) = 0 \rightarrow (1)$$

$$-\left(\frac{V_2 - 10}{390}\right) - \frac{V_2}{180} - (V_2 - V_1) = 0 \rightarrow (2)$$

At node 1

$$V_1 \left[-\frac{1}{330} - \frac{1}{220} - \frac{1}{270} \right] + V_2 \left[\frac{1}{270} \right] = -\frac{12}{330} \rightarrow (3)$$

$$V_1 \left[\frac{1}{270} \right] + V_2 \left[-\frac{1}{390} - \frac{1}{270} - \frac{1}{180} \right] = -\frac{10}{390} \rightarrow (4)$$

Solving (3) and (4)

$$V_1 = 4.3872 \text{ V}$$

$$V_2 = 3.5426 \text{ V}$$

Teacher's Signature _____

Mesh Method

In loop (1)

$$12 - i_1 (330 + 220) + 220 i_2 = 0$$

$$550 i_1 - 220 i_2 = 12 \rightarrow (1)$$

In loop (2)

$$0 - i_2 (220 + 180 + 270) + 220 i_1 + 180 i_3 = 0$$

$$220 i_1 - 670 i_2 + 180 i_3 = 0 \rightarrow (2)$$

In loop (3)

$$10 - i_3 (180 + 390) + 180 i_2 = 0$$

$$180 i_2 - 570 i_3 = -10$$

Solving equations (1), (2) and (3) we get

$$i_1 = 0.027 \text{ A}$$

$$i_2 = 0.025 \text{ A}$$

$$i_3 = -0.022 \text{ A} \quad (\text{negative sign indicates that the direction of current is reversed from what we have assumed})$$

~~current across 330 Ω resistor.~~

~~$$\frac{12 - 4.38}{330} = 0.02305 \text{ A}$$
$$= 23.05 \text{ mA}$$~~

current through 330 Ω

$$\frac{12 - 4.38}{330} = 0.02309 \text{ A}$$

$$= 23.06 \text{ mA}$$

current through 220 Ω

$$\frac{4.38 - 0}{220} = 0.0199$$

$$= 19.9 \text{ mA}$$

current through 270 Ω

$$\frac{4.38 - 3.54}{270} = 0.00311$$

$$= 3.11 \text{ mA}$$

current through 180 Ω

$$\frac{3.54 - 0}{180} = 0.01966$$

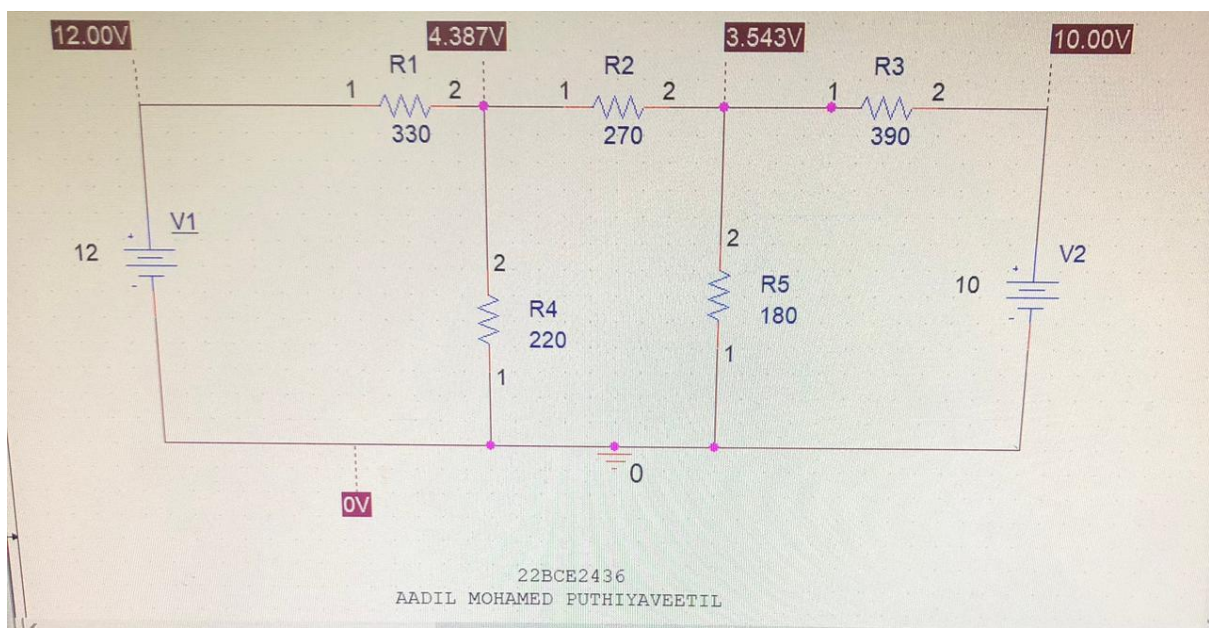
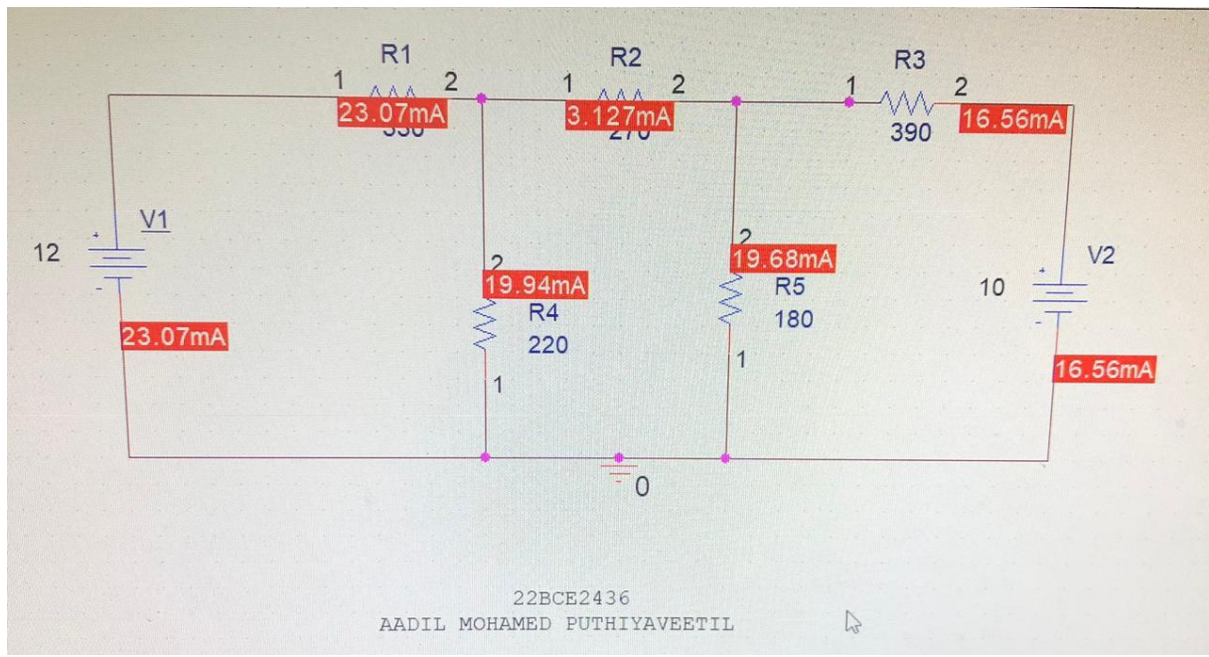
$$= 19.67 \text{ mA}$$

current through 390 Ω

$$\frac{10 - 3.54}{390} = 0.016567$$

$$= 16.57 \text{ mA}$$

SIMULATION CIRCUITS WITH VALUE TAGS



TABULATION OF MANUAL AND SIMULATION VALUES:

<u>PARAMETERS</u>	<u>MANUAL</u>	<u>SIMULATION</u>
V1	4.3872 V	4.387 V
V2	3.5426 V	3.543 V
I1	0.0230 A	0.02307 A
I2	0.003126 A	0.003127 A
I3	0.01655 A	0.01656 A

INFERENCE:

From the above manual calculation and simulation , we can conclude that KCL and KVL are verified.

VERIFICATION PAGE WITH FACULTY SIGN:

