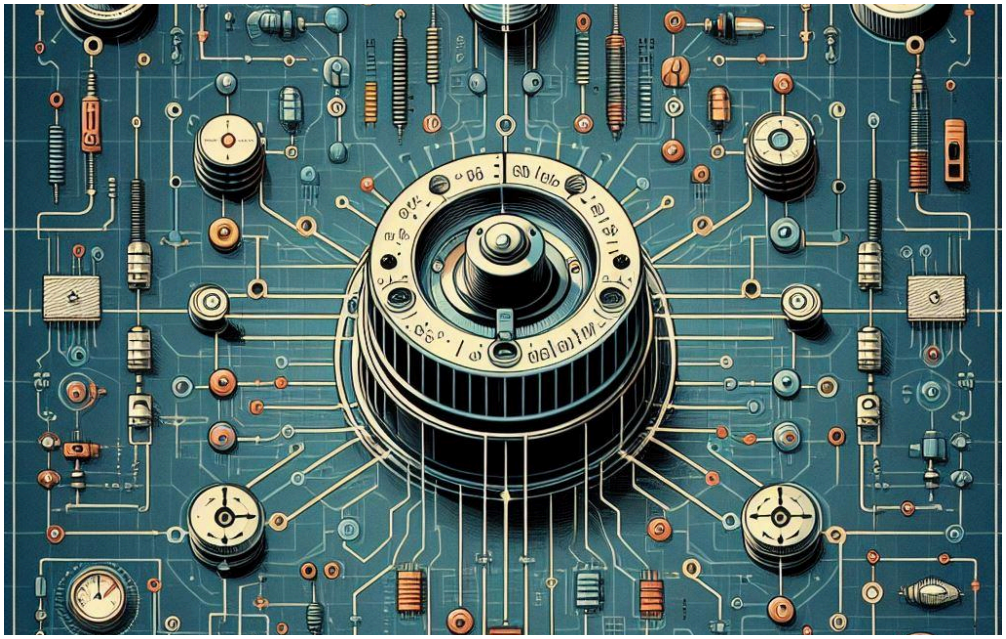
Post Lab Report of Electrical Circuits

Lab 02: Series-Parallel DC Circuit and Verification of Kirchhoff's Laws



Submitted By: Group 2

Aklhak Hossain
2022-3-60-057
https://ahjim.com

Saba Tasnim Khan
2022-3-60-049

Momo Bhuiyan
2022-2-60-020

Sabiha Nusrat
2022-1-60-303

Submitted To:

M. Saddam Hossain Khan
Senior Lecturer
Department of CSE
East West University

Post Lab Report

Question 1: Calculate the values of V1, V2, V3, I1, I2, and I3 of the circuit using measured values of E, R1, R2, and R3. Compare the calculated values with the measured values and give reason if any discrepancy is found.

Solution:

We know,

$R_p = 1 / (1 / 46.8 + 1 / 98.9) = 31.767\Omega$

So,

$R_{eq} = 100.2 + 31.767 = 131.97\Omega$

So,

$I_1 = E / R_{eq} = 3 / 131.97 = 0.023A$

Now,

$V_1 = I_1 * R_1 = 0.023 * 100.2 = 2.28V$

$V_2 = I_1 * R_p = 0.023 * 31.767 = 0.72V$

$V_3 = I_1 * R_p = 0.023 * 31.767 = 0.72V$

$I_2 = V_2 / R_2 = 0.72 / 46.8 = 0.015A$

$I_3 = V_3 / R_3 = 0.72 / 98.9 = 0.007A$

Title	Measured Values	Calculated values
Value of E (V)	3	3
Value of V_1 (V)	2.2	2.28
Value of V_2 (V)	0.8	0.72
Value of V_3 (V)	0.8	0.72
Value of I_1 (mA)	20	23
Value of I_2 (mA)	13	15
Value of I_3 (mA)	6	7

The discrepancy is mainly because of mechanical and Human errors.

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Question 2: From the calculated values of V_1, V_2, V_3, I_1, I_2, and I_3, show that (i) $V_2 = V_3$, (ii) $E=V_1 + V_2$ (KVL), and (iii) $I_1 = I_2 + I_3$ (KCL).

Solution:

(i) From the calculated values of $\mathbf{V_2}$ and $\mathbf{V_3}$, We see,

$V_2 = V_3 = 0.72V$

(ii) From the calculated values,

$V_1 = 2.28V$

$V_2 = 0.72V$ and

$E = 3V$

So,

$\mathbf{V_1} + \mathbf{V_2} = 2.28 + 0.72 = 3V = \mathbf{E}$

(iii) From the calculated values,

$I_1 = 23mA$

$I_2 = 15mA$ and

$I_3 = 7mA$

So,

$\mathbf{I_2} + \mathbf{I_3} = 15 + 7 = 22mA \approx \mathbf{I_1}$

----------x----------

Group :02 Members: 1) Akhlak Hossain (2022-3-60-057)
2) Saba Tasnima (2022-3-60-049)
3) Momo Bhuiyan (2022-2-60-020)
4) Sabiha Nusrat (2022-1-60-303)

Lab:2 (Series-Parallel DC Circuit & verification of Kirchhoff's Law.)

Measured value of E(V)	Measured value of V_1 (V)	Measured value of V_2 (V)	Measured value of V_3 (V)	Measured value of I_1 (mA)	Measured value of I_2 (mA)	Measured value of I_3 (mA)	Measured value of Resistances (Ω)
3	2.2	0.8	0.8	20	13	6	$R_1 = 100.2$ $R_2 = 46.8$ $R_3 = 98.9$

Lab procedure:-

3.

(i) We got,

$V_2 = 0.8V$

$V_3 = 0.8V$

So, $V_2 = V_3$

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(ii) We got, $V_1 = 2.2V$

$V_2 = 0.8V$

$\therefore V_1 + V_2 = (2.2 + 0.8)V = 3V$

$\therefore E = 3V$

(iii) We got, $I_1 = 20mA$; $I_2 = 13mA$ & $I_3 = 6mA$

$\therefore I_2 + I_3 = (13 + 6)mA = 19mA$

$\therefore I_1 = I_2 + I_3$

So, $I_1 \simeq I_2 + I_3$

Akthak Hossain
2022-3-60-057
CSE209-Lab-2
Section: 4
Group: 2

Pre Lab (2)

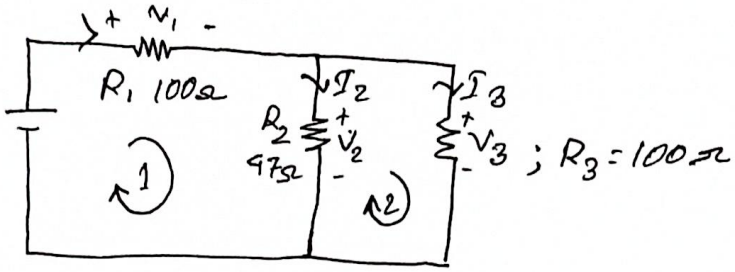

Figure: Circuit for Experiment

Solution:

Applying KVL at loop1:

$3 - V_1 - V_2 = 0$

$\Rightarrow 3 - 100I_1 - 47I_2 = 0 \quad \cdots (I)$

Applying KVL at loop2:

$V_3 + V_2 = 0$

$\Rightarrow 47I_2 + 100I_3 = 0 \quad \cdots (II)$

Applying KCL at node a, $I_1 = I_2 + I_3 \quad (III)$

Solving eqn (I), (II) and (III) we get,

$3 - 100(I_2 + I_3) - 47I_2 = 0$

$\Rightarrow 3 - 147I_2 - 100I_3 = 0$

CamScanner

$\therefore I_1 = 023A$ and $V_1 = 2.3V$

$I_2 = 0.154\ A$ $V_2 = 0.723V$

$I_3 = 0.0072A$ $V_3 = 0.723V$

Answer 2:

(I)

we got,

$V_2 = 0.723\ V$; $V_3 = 0.723V$,

$\therefore V_2 = V_3$

(II)

we got,

$V_1 = 2.3V$; $V_2 = 0.723\ V$

$\therefore V_1 + V_2 = (2.3 + 0.723)$

$= 3.023$

$\approx 3\ V$

$\therefore E = 3V$ $\therefore V_1 + V_2 = E$

(III)

we got,

$I_1 = 0.23A$, $I_2 = 0.154A$ and $I_3 = 0.0072A$

$\therefore I_2 + I_3 = (0.0154 + 0.0027)\ A = 2.3A = I_1$

$\therefore I_1 = I_2 + I_3$

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Group – 02

Pre-lab-2

Circuit Diagram:-

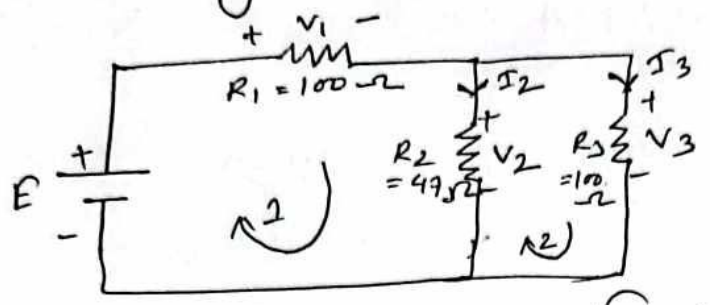

Fig: Circuit For Experiment

Soln:-

Applying KVL at loop 1,

$$3 - V_1 - V_2 = 0$$

$$\Rightarrow 3 - 100I_1 - 47I_2 = 0 \quad \cdots (I)$$

Applying KVL at loop 2,

$$V_2 + V_3 = 0$$

$$\Rightarrow 47I_2 + 100I_3 = 0 \quad \cdots (II)$$

Applying KCL at note a, $I_1 = I_2 + I_3$ ---(III)

Solving eqn (I), (II) and (III) we get,

$$3 - 100(I_2 + I_3) - 47I_2 = 0$$

$$\Rightarrow 3 - 147I_2 - 100I_3 = 0$$

$\therefore I_1 = 0.23A$ and, $V_1 = 2.3\,V$

$I_2 = 0.134A$ $\quad V_2 = 0.723\,V$

$I_3 = 0.0072A$ $\quad V_3 = 0.723\,V$

(2) (i) We got, $V_2 = 0.723\,V$

$V_3 = 0.723\,V$

$\therefore V_2 = V_3$

(ii) We got, $V_1 = 2.3\,V$

$V_2 = 0.723\,V$

$\therefore V_1 + V_2 = (2.3 + 0.723)\,V$

$= 3.023\,V$

$\approx 3\,V$

$\therefore E = 3\,V$

$\therefore V_1 + V_2 = E$

(iii) We got, $I_1 = 0.23A$, $I_2 = 0.154\,A$

ad $I_3 = 0.0072A$

$\therefore I_2 + I_3 = (0.0154 + 0.0072)\,A$

$= 2.3A$

$= I_1$

$\therefore I_1 = I_2 + I_3$

Momo Bhuiyan
ID: 2022-2-60-020

1. Solution:

From figure 4,

$R_x = R_2 \,||\, R_3$

$\Rightarrow \frac{1}{R_x} = \left(\frac{1}{47} + \frac{1}{100}\right)$

$\Rightarrow R_x = \left(\frac{1}{47} + \frac{1}{100}\right)^{-1}$

$= 31.97 \Omega$

$Req = R_1 + R_x$

$= 100 + 31.97\ \Omega$

$= 131.97\ \Omega$

We know that,

$E = I_1 Req$

$I_1 = \frac{3}{131.97} = 0.022732439 19\ A \times 10^{-3}$

$= 22.7\ mA$

$I_2 = \frac{R_3 \times I_1}{R_2 + R_3}$

$= \frac{100 \times 22.7}{47 + 100}$

$= 15.44\ mA$

...e minimum deviation and prism angle?

$$I_3 = \frac{R_2 * I_1}{R_2 + R_3}$$

$$= \frac{47 \times 22.7}{47 + 100}$$

$$= 7.26 \text{ mA}$$

Applying Ohm's law,

$V_1 = I_1 R_1 = (22.7 \text{ mA} \times 100\,\Omega) = 2.27 \text{ V}$

$V_2 = I_2 R_2 = (15.44 \text{ mA} \times 47\,\Omega) = 0.72 \text{ V}$

$V_3 = I_3 R_3 = (7.26 \text{ mA} \times 100\,\Omega) = 0.72 \text{ V}$

2. Solution:

From question no. 1

$I_1 = 22.7 \text{ mA}$, $I_2 = 15.44 \text{ mA}$, $I_3 = 7.26 \text{ mA}$

$V_1 = 2.27 \text{ V}$, $V_2 = 0.72 \text{ V}$, $V_3 = 0.72 \text{ V}$

(i) Here, the value of V_2 and V_3 are equal. Their values should be same, because the voltages of parallel circuit are always equal.

So, $V_2 = V_3$ (showed)

(ii) From question 1,

$V_1 = 2.27\ V$, $V_2 = 0.72\ V$

Using KVL at loop 1,

$E = V_1 + V_2$

$= (2.27 + 0.72)\ V$

$= 3\ V$

(iii) From question 1,

$I_1 = 22.7\ mA$

$I_2 = 15.44\ mA$

$I_3 = 7.26\ mA$

Using KCL at node 2,

$-I_1 + I_2 + I_3 = 0$

$\Rightarrow I_1 = I_2 + I_3$

$= (15.44\ mA + 7.26\ mA)$

$= 22.7\ mA$

Name : Sabiha Nusrat

ID : 2022-1-60-303

CSE 209 : Electric Circuit

Section : 04

Pre Lab Report : 02

Lab Expt No : 2

Title :- Series-Parallel DC Circuit and Verification of Kirchhoff's laws.

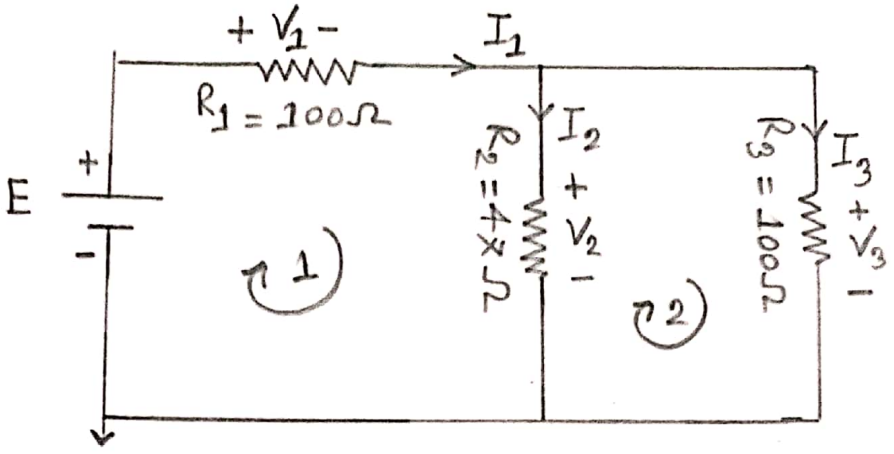

Figure 4. Circuit for experiment.

Pre Lab Question Answer:-

Applying KVL at loop 1;

$$3 - V_1 - V_2 = 0$$

$$\Rightarrow 3 - 100 I_1 - 47 I_2 = 0 \quad \ldots\ldots\ldots (i)$$

Applying KVL at loop 2, $V_2 + V_3 = 0$

$$\Rightarrow 47 I_2 + 100 I_3 = 0 \quad \ldots\ldots\ldots (ii)$$

Applying KCL at note a, $I_1 = I_2 + I_3 \quad \ldots\ldots (iii)$

Solving equation (i), (ii) & (iii), we get;

$$3 - 100 (I_2 + I_3) - 47 I_2 = 0$$

$$\Rightarrow 3 - 147 I_2 - 100 I_3 = 0$$

$\therefore I_1 = 0.23A$ & $V_1 = 2.3V$

$I_2 = 0.134A$ $\quad V_2 = 0.723V$

$I_3 = 0.0072A$ $\quad V_3 = 0.723V$

(2) $\Rightarrow$

(i) We got $V_2 = 0.723V$

$V_3 = 0.723V$

$\therefore V_2 = V_3$

(ii) We got, $V_1 = 2.3V$

$V_2 = 0.723V$

$\therefore V_1 + V_2 = (2.3V + 0.723V)$

$= 3.023V$

$\therefore E \approx 3V$

$\therefore V_1 + V_2 = E$

(iii) We got, $I_1 = 0.23A$, $I_2 = 0.154A$

& $I_3 = 0.0072A$

$\therefore I_2 + I_3 = (0.0154 + 0.0072)A$

$= 2.3A$

$= I_1$

$\therefore I_1 = I_2 + I_3$