East West University

Department of CSE

LAB REPORT

Course Code and Name: CSE-209 Electrical Circuits	
Experiment no: 01 **Group**-09	
Experiment name: Introduction to Circuit Elements and Variables	
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Date of Submittion:12-11-2024	**Pre-lab marks:**
	Post-lab marks:
	Total marks:

Experiment Title: Introduction to Circuit Elements and variables.

Abstract:

From this experiment it can be learnt that how to be familiar with basic electronic components like circuit variables, elements such as ammeter, voltmeter etc. Also, it shows mathematical and graphical analysis. It also shows that the theoretical and experimental values are slightly differences due to errors. There are also usages of laws like ohm's law.

Objectives:

1. To understand circuit variables like voltage and current, circuit elements such as voltage source and resistance and how to use them in experiments.
2. To observe how a voltmeter can show the DC voltage which are using in experiment.
3. To use of Ohm's law and observe the values theoretically and practically.
4. To observe and measure basic variables like resistance and learn how to measure resistance of a resistor using a multimeter.
5. To learn using of breadboard and connecting wires and how to measure DC current through a circuit element using an ammeter.

Theory and Experimental Methods

Theoretical Explanations:

Energy is supplied by an active element. A voltage source or a battery serves as an active element. The unit used to measure the emf of a battery is the volt (V). Energy is absorbed by a passive element, with a resistor acting as a passive element. The resistance of a resistor is measured in Ohms (Ω).

The current through a circuit element and the voltage across a circuit element are the important variables. The current and voltage through a circuit element is measured in Amperes (A) and is measured in Volts (V). The emf of the battery is represented by E volts and the resistance of the resistor is represented by R Ω. The same current is represented by I A, is drawn from the battery and passes through the resistor. The voltage drops across the resistor is V volts.

An ammeter is used for measuring current, and a voltmeter is used for measuring voltage. an ammeter is connected in series with the element through which the current is to be measured. A voltmeter is connected in parallel with the element across which the voltage is to be measured. If an ammeter is connected in parallel with an element, the meter may be damaged. If a voltmeter is connected in series with an element, an incorrect reading will result. Therefore, care should be taken to avoid connecting an ammeter in parallel or a voltmeter in series. For measuring value the equation can be used, V = IR.

Circuit Diagram:

Figure-1:

Experimental Datasheet:

Table-1

Observation Number	Set Value of E (V)	Measured Value of V (V)	Measured Value of I (mA)	Measured Value of R (KΩ)
1	5	5	5	
2	6	5.99	6	
3	7	6.9	7	0.98 Ω
4	8	8	8.1	
5	9	9	9.1	
6	10	9.9	10	

Discussion and Analysis:

1. Small differences in this chart are shown which can be rise because of resistors, measurement errors.
2. To avoid incorrect values, the voltmeter needs to be connected parallelly with the resistor.
3. If the ammeter is connected in series with the resistor, device will be cursed.
4. The voltage source should be handled carefully and the supplied voltage should be accurately measured.

<u>**Answers of Post Lab Questions**</u>

1. **Theoretically calculate the values of *I*, using measured values of *V* and *R*. Compare the theoretical values with the measured values and comment on any discrepancy.**

<u>**Solution:**</u>

<u>**Table -2:**</u>

Observation Number	Measured Value of V (V)	Measured Value of R (KΩ)	Theoretically Calculated Value of I (mA)
1	5	0.98 KΩ	5.1
2	5.99		6.11
3	6.9		7.04
4	8		8.16
5	9		9.18
6	9.9		10.1

Comparison between theoretically calculated values and measured values:

Table-3:

Observation Number	Theoretically Calculated Value of I (mA)	Measured Value of I (mA)
1	5.1	5
2	6.11	6
3	7.04	7
4	8.16	8
5	9.18	9
6	10.1	10

This comparison shows that there are some differrences between theoretically calculated values and measured values of **I.** The theoretical values and the measured values can be varied. And that's happened because of Instrument resolution or Zero offset or Instrument drift or Personal errors.

2. **Theoretically calculate the values of *R* from the measured values of *V* and *I* using Ohm's law. Compare the calculated and measured of *R* and comment on any discrepancy.**

<u>Solution:</u>

We know, Ohm's Law is,

$$V = IR$$

$$\Rightarrow R = \frac{V}{I}$$

When V = 5V and I = 5mA, $R = \frac{5}{5} = 1\text{K}\Omega$

When V = 5.99V and I = 6mA, $R = \frac{5.99}{6} = 0.998\text{K}\Omega$

When V = 6.9V and I = 7mA, $R = \frac{6.9}{7} = 0.986\text{K}\Omega$

When V = 8V and I = 8mA, $R = \frac{8}{8} = 1\text{K}\Omega$

When V = 9V and I = 9mA, $R = \frac{9}{9} = 1\text{K}\Omega$

When V = 9.9V and I = 10mA, $R = \frac{9.9}{10} = 0.99\text{K}\Omega$

Comparison between theoretically calculated values and measured values:

Table-4:

Observation Number	**Theoretically Calculated Value of R (KΩ)**	**Measured Value of R (KΩ)**
1	1 KΩ	0.98KΩ
2	0.998 KΩ	
3	0.986 KΩ	
4	1 KΩ	
5	1 KΩ	
6	0.99 KΩ	

This comparison shows that there are some discrepancies between theoretically calculated values and measured values of **R.** The theoretical values and the measured values vary. When the resistance calculated using Ohm's law was compared to the one measured in the experiment, it was noted that they didn't always match up. This could be attributed to potential inaccuracies in the tools used, or to the condition of the wires and connections within the circuit. Variations in resistance were observed due to factors such as temperature changes, and errors may have been introduced during setup or while recording the results. Thus, it is emphasized that caution should be exercised, and thorough double-checking of all aspects is essential when conducting experiments of this nature.

3. **Compare the set value of E and the measured value of *V* and comment on any discrepancy.**

Solution:

Table-5:

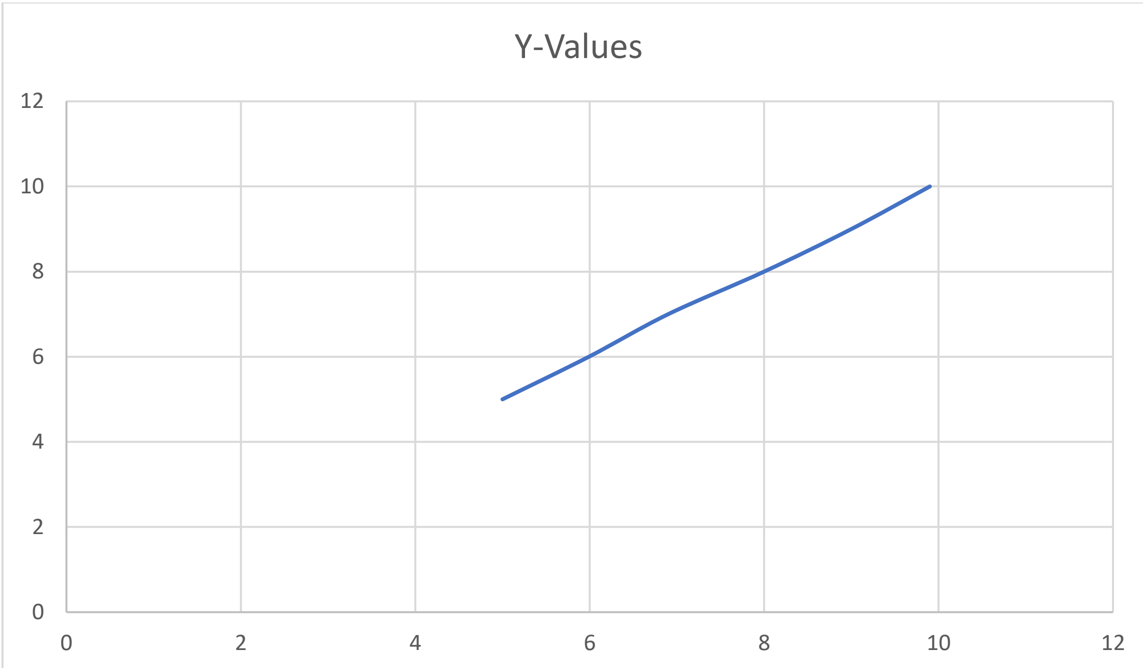
Observation Number	**Set Value of E (V)**	**Measured Value of V (V)**
1	5	5
2	6	5.99
3	7	6.9
4	8	8
5	9	9
6	10	9.9

This comparison shows that there are some discrepancies between set values of **E** values and measured values of **V.** The theoretical values and the measured values vary.

4. **Plot V vs. (taking I as independent variable) and fit a straight-line passing through the origin. From the plot determine the resistance of the supplied resistor using Ohm's law. Compare this value with the measured value and comment on any discrepancy.**

Solution:

Figure-2:



Plot: 1

Here, $x_1 = 5$, $y_1 = 5$
$x_2 = 9.9$, $y_2 = 10$

$\therefore$ slope = $\frac{y_2 - y_1}{x_2 - x_1} = 1.02$

$\therefore$ Resistance = 1.01 kΩ

Thus, here the measured values and the theoretical values are not accurate.

5. Discuss how voltage or current is measured using a multi-range meter.

Solution:

A multi-range meter often a digital or analog multimeter is an instrument used to measure voltage, current, and sometimes other electrical parameters across multiple ranges.

Voltage Measurement:

Select an appropriate voltage range based on the expected level in the circuit, such as 200mV, 2V, 20V, or 200V. Connect the multimeter's leads across the circuit or component where you want to measure the voltage, making sure the red lead goes to the positive terminal and the black lead to the negative terminal.

CurrentMeasurement:
Choose a suitable current range according to the expected current in the circuit; common options include 200µA, 2mA, 20mA, or 200mA. To measure current, connect the multimeter in series with the circuit by breaking the circuit and inserting the meter in line with the current flow. Be careful not to measure currents above the selected range's maximum limit, as this could damage the multimeter’s fuse or the device itself.

Using a multi-range meter allows accurate measurement of a variety of voltages and currents. Selecting the correct range and ensuring proper polarity and connection helps achieve reliable results and protects both the meter and the circuit.

Multi-range meters have different settings for ranges to improve accuracy have to start with the highest range when unsure of the measurement, especially with current, to protect the meter and avoid damage.

Results and Discussion

After completing our experiment, we can see that there is slight changes in values of V, I, R. Theoretical and measured values are not same it can vary. When we measured values (Table-3) of I there were accurate (5,6,7,8,9,10) but in theoretical values slightly increased and values became (5.1,6.11,7.04,8.16,9.18 and 10.1). If we see to value R (resistance) there were (Table-4) also ups and down, not always same as 098Kohm. From (Table-5), we can say when we took the values of volts as (5,6,7,8,9,10) but we measured in experiment we didn’t find always same sometimes it showed different values such as (5.99,6.9 and 9.9). Also, from the graph we can analysis that there is a straight line in the graph. And the overall resistance of this graph is 1.01kohm.

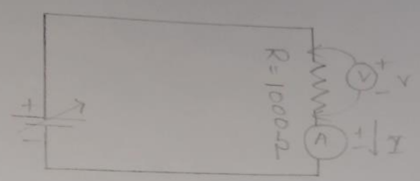
Conclusion

When we are taking the values of voltage and current from the voltmeter and ammeter, we have to be careful in taking values. The connection of voltmeter and ammeter should be connected correctly, if there is any fault in set up, then it will show wrong answer and sometimes instruments burn.

Pre-lab of Group Members:

Name - Isrrat Jahan Rifa
ID - 2022-2-60-098

Circuit Diagram:



For, $E_1 = 5V$; $I_1 = \frac{V}{R}$

$= \frac{5}{1000} = 5\times10^{-3}A = 5mA$

$E_2 = 6V$; $I_2 = \frac{E_2}{R} = \frac{6}{1000} = 6mA$

$E_3 = \cancel{7}6V$; $I_3 = \frac{E_3}{R} = \frac{7}{1000} = 7mA$

$E_4 = 8V$; $I_4 = \frac{E_4}{R} = \frac{8}{1000} = 8mA$

$E_5 = 9V$; $I_5 = \frac{E_5}{R} = \frac{9}{1000} = 9mA$

$E_6 = 10V$; $I_6 = \frac{E_6}{R} = \frac{10}{1000} = 10mA$

Name: Lobabah Rahman
ID : 2023-3-60-104

Experiment : 01
Pre-Lab Report Question:

1. Theoretically calculate the values of I for the circuit of Figures 3 for E = 5, 6, 7, 8, 9, 10 V and R = 1000 Ω.

Solution: Here given, E = 5, 6, 7, 8, 9, 10 v
And, R = 1000 Ω

We know, $I = \frac{V}{R} = \frac{E}{R}$

when, E = 5v ; $I = \frac{5v}{1000\Omega} = 5mA$

when, E = 6v ; $I = \frac{6v}{1000\Omega} = 6mA$

when, E = 7v ; $I = \frac{7v}{1000\Omega} = 7mA$

when, E = 8v ; $I = \frac{8v}{1000\Omega} = 8mA$

when, E = 9v ; $I = \frac{9v}{1000\Omega} = 9mA$

when, E = 10v ; $I = \frac{10v}{1000\Omega} = 10mA$

Therefore, the values of I = 5mA, 6mA, 7mA, 8mA, 9mA, 10mA.

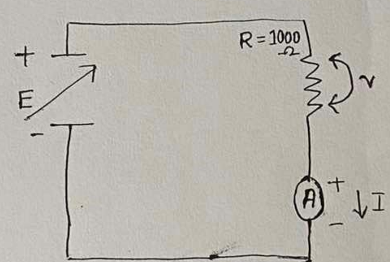
Name : Badhon Bacchu
ID : 2023-3-60-482

Experiment : 01

Pre-lab report Questions:

1. Theoretically calculate the values of I for the circuit of Figure 3 for $E = 5, 6, 7, 8, 9, 10V$ and $R = 1000\,\Omega$.

Solution: Circuit Diagram:



We know,

$$E = IR$$

$$\therefore I = \frac{E}{R}$$

For, $E = 5\ V$

$$I = \frac{5}{1000} = 5\ mA$$

For, $E = 6V$

$$I = \frac{6}{1000} = 6\ mA$$

For, $E = 7V$

$$I = \frac{7}{1000} = 7\ mA$$

For, $E = 8V$

$$I = \frac{8}{1000} = 8\ mA$$

For, $E = 9V$

$$I = \frac{9}{1000} = 9\ mA$$

For, $E = 10V$

$$I = \frac{10}{1000} = 10\ mA$$

Mehezabin Ahmed
2022-2-60-227

Experiment no: 01 (Pre lab)

Here, given the value of I for the circuit of figure:03

$E = (5, 6, 7, 8, 9, 10) V$

$R = 1000 \Omega$

Now, we know, $I = \frac{E}{R}$; $V = E$

for,

$E = 5V$, $I = \frac{5V}{1000\Omega} = 5mA$

$E = 6V$ $I = \frac{6V}{1000\Omega} = 6mA$

$E = 7V$, $I = \frac{7V}{1000\Omega} = 7mA$

$E = 8V$, $I = \frac{8V}{1000\Omega} = 8mA$

$E = 9V$, $I = \frac{9V}{1000\Omega} = 9mA$

$E = 10V$, $I = \frac{10V}{1000\Omega} = 10mA$

$\therefore$ The value of $I = 5mA, 6mA, 7mA, 8mA, 9mA, 10mA$.

Experimental Datasheet:

Experiment : 1

Course : CSE209

Table 1. Experimental Datasheet

Observation number	Set Value of E(V)	Measured Value of V(V)	Measured value of I (mA)	Measured Value of R (Ω)
1	5	5	5	
2	6	5.99	6	
3	7	6.9	7	0.98
4	8	8	8.1	
5	9	9	9.1	
6	10	9.9	10	

Group-09

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06/11/24