****

**East West University**

**Department of Computer Science and Engineering**

**Course: CSE109 Electrical Circuits**

**Expt No.: 1**

**Title: Introduction to Circuit Elements and Variables**

**Objectives:**

1. To get familiar with circuit variables (voltage and current) and circuit elements (voltage source and resistance).

2. To learn how to measure dc voltage across a circuit element using a voltmeter.

3. To learn how to measure dc current through a circuit element using an ammeter.

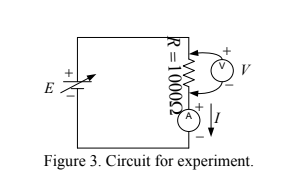
4. To learn how to measure resistance of a resistor using a multimeter.

5. To verify Ohm’s Law.

**Theory (Summary):**

Electric circuits have two kinds of parts: active ones that give power (like batteries) and passive ones that use power (like resistors). The main things we measure in circuits are current (in Amps) and voltage (in Volts). In Ohm's Law: the voltage across a resistor is just the current through it times the resistance (V=IR). In easy circuits, the voltage drop matches the battery's voltage. To measure stuff, we use an ammeter for current (connect it in series) and a voltmeter for voltage (connect it in parallel). We need to be careful putting an ammeter in parallel or a voltmeter in series can mess up readings or even break the tools. Always double check connections to get the right measurements.

**Circuit Diagram:**

****

**Pre-Lab:**

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

| **Observation number** | **Set Value of E(V)** | **Measured value of I (A)** | **Measured value of R** |
| --- | --- | --- | --- |
| **1** | **5** | **0.005** | **1000** |
| **2** | **6** | **0.006** |
| **3** | **7** | **0.007** |
| **4** | **8** | **0.008** |
| **5** | **9** | **0.009** |
| **6** | **10** | **0.010** |

**Experimental Datasheet:**

| **Observation number** | **Set Value of E(V)** | **Measured Value of V (V)** | **Measured value of I (mA)** | **Measured value of R** |
| --- | --- | --- | --- | --- |
| **1** | **5** | **5.1** | **4** | **972.9** |
| **2** | **6** | **6.1** | **4.6** |
| **3** | **7** | **7.1** | **6** |
| **4** | **8** | **8.1** | **6.2** |
| **5** | **9** | **9.1** | **8** |
| **6** | **10** | **10.1** | **9.2** |

**Post-Lab:**

**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.

**Answer:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Measured value of V(V)** | **Measured value of R (Ω)** | **Calculated value of I (A)** | **Measured value of I (mA)** |
| 5.1 | 972.9 |  | **4** |
| 6.1 |  | **4.6** |
| 7.1 |  | **6** |
| 8.1 | 972.9 |  | **6.2** |
| 9.1 |  | **8** |
| 10.1 |  | **9.2** |

**Comment:** Because the measured values were measured in the physical lab, there was discrepancy between the theoretical values and measured values of I. In simulation there would be no discrepancy.

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

**Answer:**

According to Ohm’s law we know,

E = IR or R = E/I ---- (1)

Where, E = Voltage, I = Current & R = Resistance

Here, Measured values of Current,

I = 4mA, 4.6mA, 6mA, 6.2mA, 8mA & 9.2mA,

I = 0.004A, 0.0046A, 0.006A, 0.0062A, 0.008A & 0.0092A,

Measured values of Voltage,

E = 5.1V, 6.1V, 7.1V, 8.1V, 9.1V & 10.1V

From equation (1),

**Comment:** After comparing the calculated and measured values of *R*, we can observe that there is discrepancy between the theoretical value and measured values of R. Because the lab was done physically. In simulation there would be no discrepancy.

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

**Answer:**

|  |  |
| --- | --- |
| **Set Value of *E* (V)** | **Measured value of *V* (V)** |
| 5 | 5.1 |
| 6 | 6.1 |
| 7 | 7.1 |
| 8 | 8.1 |
| 9 | 9.1 |
| 10 | 10.1 |

**Comment:** After comparing the set value of E and the measured value of V, we can observe that they are not same. Since this experiment was carried out physically there was some error as a result, the measured values of E are identical to the set values of V. So, there is a discrepancy.

**4.** Plot V vs. I (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.

**Answer:**

**Figure: (I-V) Curve**

According to Ohm’s law we know,

E = IR

or, R = EI

Here, R is the slope of the graph and R = 1000Ω

Our measured value of R is also 972.9Ω

**Comment**: After comparing the calculated value of R from the plot and measured value of R, we can observe that there is discrepancy between these values. If it was simulated there would not be discrepancy. As the lab was done physically, there is discrepancy.

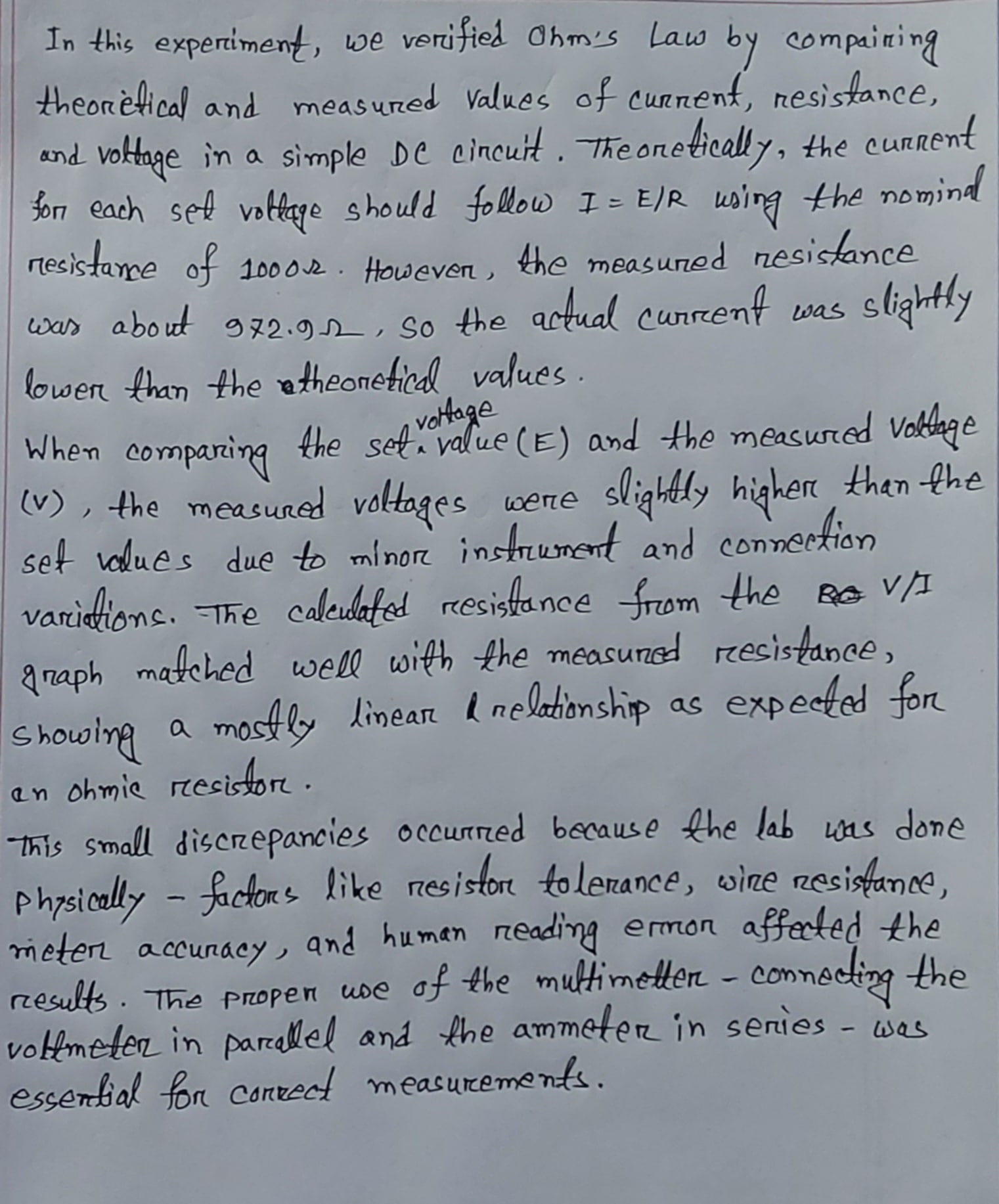
**5.** Discuss how voltage or current is measured using a multi-range meter.

**Answer:** In order to regulate the voltage or current using a multi-mode meter, you have to first adjust the dial to the right configuration Volts (V) to measure voltage and Amps (A) to measure current. To prevent damaging the meter always use a range just higher than the value your intent to measure.

**To Measure Voltage:** Put the meter in parallel to the component. This implies that you put the probes or one side of the component.

**To measure current:** Place a meter in series with the circuit. You need to open the circuit, insert meter in the circuit so that current passes through the meter.

**Discussion:**

****