North South University
Department of Electrical & Computer Engineering

LAB REPORT

Course Code: EEE- 191L

Course Title: Electrical Circuits Lab

Faculty: RQN

Experiment Number: 1 and 2

Experiment Name:

Verification of Ohms law, Voltage division and KVL

Experiment Date: 12/2/25

Date of Submission: 19/2/25

Section: 19

Group Number: 2

Submitted To: KASHFIA MAHMOOD

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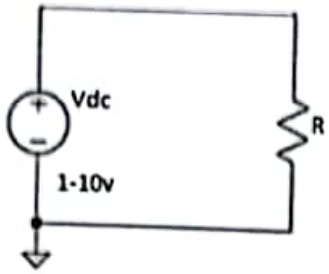
DEPARTMENT OF ELECTRICAL & COMPUTER ENGINEERING

EEE411L/ETE141L

Exp1: Verification of Ohm's Law

Circuit Diagram:



Circuit 1

List of Components:

- Trainer board
- Resistors (3.3 KΩ, 5.6 KΩ)
- Digital Multimeter (DMM)
- Connecting Wire

Procedure:

1. Identify the given resistors using color coding and fill in the required columns in Table 1.
2. Measure the resistances of the resistors using the DMM and fill in the required column in Table 1.
3. Calculate the percentage error of the resistance values.
   Percentage Error = |(Practical value – Theoretical value)| / Theoretical value
4. Build circuit 1 using the 3.3 KΩ resistor.
5. Set the voltage source to 2 V. Check the voltage across the supply using the DMM. Open circuit before taking source voltage reading to avoid loading effect of internal resistance.
   (i) Measure the current flowing through the resistor. Note it down in Table 2.
   (ii) Calculate IR using the experimental values of I and R. Note it down in Table 2.
   (iii) Calculate the power using the experimental values of I and R (Power = I^2R).
   (iv) Repeat the above steps for 2 V to 10 V in steps of 2 V (2 V, 4 V, 6 V, 8 V, 10 V).
6. Repeat step 5-7 for the 5.6K resistor. Record data in Table 3

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Data Collection for Exp1:

Lab 1: Exp1
Group No. _____
Instructor's Signature _____

Table 1:

Resistance using colour coding					Resistance using DMM	% Error
Band 1	Band 2	Band 3	Band 4	Resistance ±tol		
Green-5	Blue- 6	Red – 2	Gold – 5 %	5600 ±5%	5.490k	1.96%
Yellow-3	Yellow-3	Red -2	Gold - 5%	3300 ±5%	3217k	2.52%

Table 2:

3.3 KΩ Voltage	Experimental readings		
	Current, I	Voltage, IR	Power, I^2R
2	0.611	1.967	1.201
4	1.283	4.13	5.295
6	1.902	6.12	11.637
8	2.586	8.32	21.513
10	3.173	10.21	32.389

Table 3

5.6 KΩ Voltage	Experimental readings		
	Current, I	Voltage, IR	Power, I^2R
2	0.352	1.936	0.680
4	0.735	4.04	2.966
6	1.105	6.07	6.703
8	1.473	8.09	11.912
10	1.834	10.07	18.466

Lab report : Experiment 1

Title : Verification of ohm's law

Objective : The objective of this experiment is to verify ohm's law by measuring voltage and current across different resistors. The results are than compared with the measured resistance values obtained using a DMM and the percentage difference is determined.

List of components :

- Trainer board
- Resistors (3.3 KΩ and 5.6 KΩ)
- Digital Multimeter (DMM)
- Connecting wire

Theory :

ohm's law states that the current (I) flowing through a ~~con~~ conductor between two points is directly proportional to the voltage (V) across the two points provided the temperature

remains constant. It is expressed as,

$V = IR$;

V = Voltage

I = Current

R = Resistance

The experimental circuit follows Ohm's law. Because,

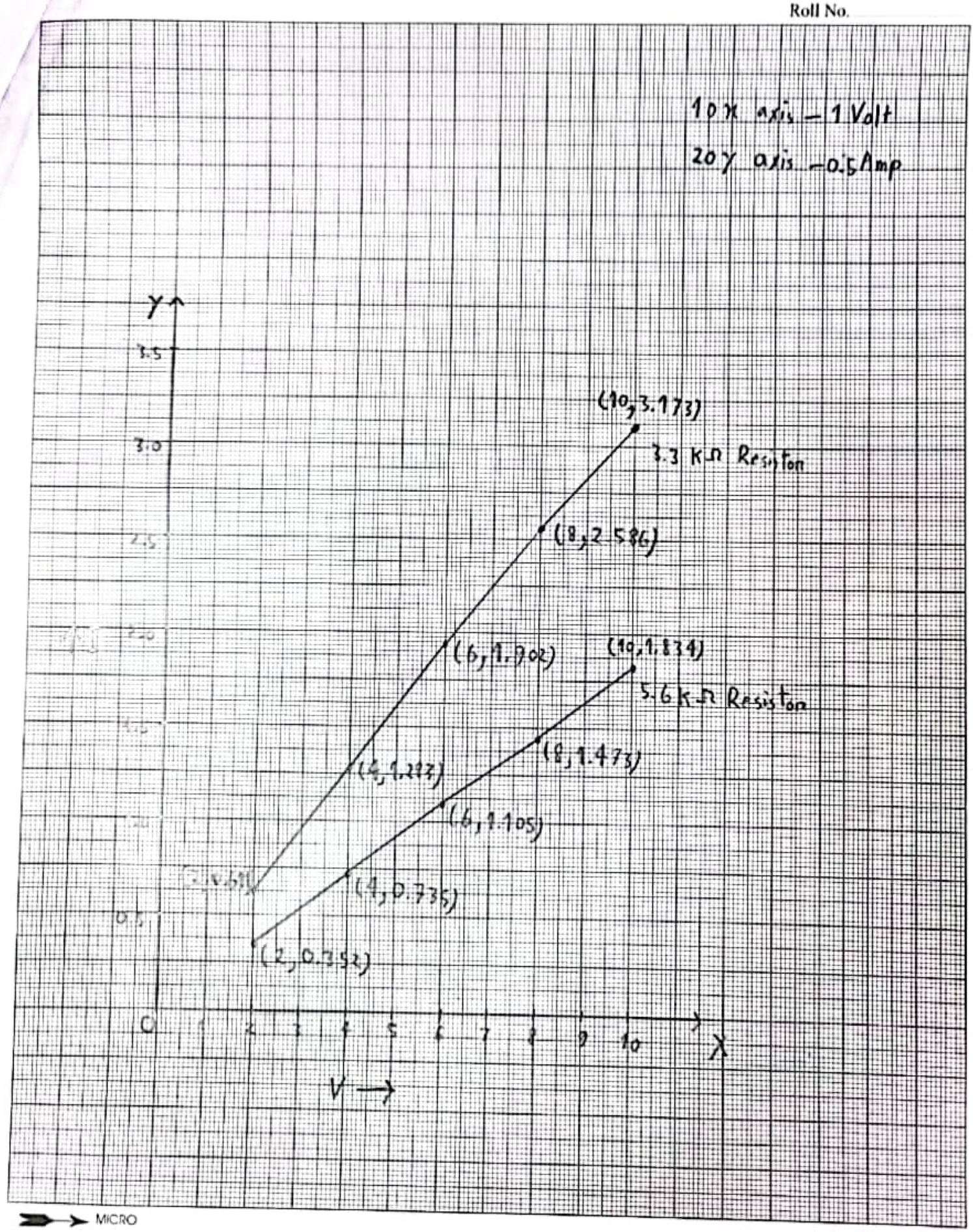
⊛ The V-I graph for both resistors is a straight line, showing that voltage and current are directly proportional.

⊛ The slope of V-I graph represents resistance. It remains nearly the same for each ~~resistan~~ resistor.

⊛ The resistance values calculated from the graph are close to those measured with a DMM, with only small differences due to minor errors in measurement.

Since the voltage and current relationship is linear and the resistance remains constant, we can conclude that the circuit follows Ohm's law.

Roll No.



MICRO

20 cm x 25 cm

Calculations:

Ohm's law $R = \frac{V}{I}$

For the 3.3 KΩ resistor,

$$R_1 = \frac{10.21}{3.173}$$

$$= 3.218 \text{ K}\Omega$$

For the 5.6 KΩ resistor,

$$R_2 = \frac{10.07}{1.834}$$

$$= 5.491 \text{ K}\Omega$$

The actual resistance values measured using DMM are

For 3.3 KΩ Resistor, $R_{T_1} = 3.3 \text{ K}\Omega$.

For 5.6 KΩ Resistor, $R_{T_2} = 5.6 \text{ K}\Omega$

We know than

$$\text{Error \%} = \frac{\text{Theoretical value} - \text{Experimental value}}{\text{Theoretical value}} \times 100$$

For 3.3 kΩ Resistor,

$$E_{error} = \frac{3.3 - 3.218}{3.3} \times 100$$

$$= 2.485\%$$

For 5.6 kΩ Resistor,

$$E_{error} = \frac{5.6 - 5.491}{5.6} \times 100$$

$$= 1.946\%$$

Exp 2: Series Circuit

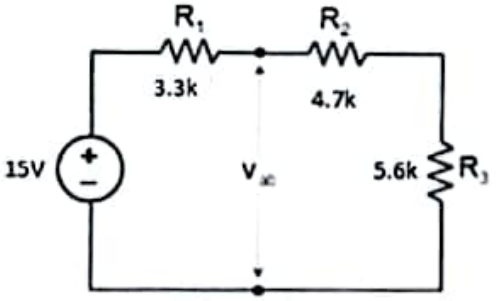
Objectives

- Learn how to connect a series circuit on a breadboard.
- Validate the voltage divider rules.
- Verify Kirchhoff's voltage law.

List of Components:

i. Trainer board
ii. Resistors (3.3 KΩ, 4.7 KΩ, 5.6K)
iii. Digital Multimeter (DMM)
iv. Connecting Wire

Circuit Diagram:



Circuit 2

Procedure:

1. Identify the given resistors using color coding and fill in the required columns in Table 1.
2. Measure the resistances of the resistors using the DMM and fill in the required column in Table 1.
3. Calculate the percentage error of the resistance values.
   Percentage Error = { |(Theoretical-Experimental)| / Theoretical value} *100%
4. Build the circuit of Fig 11.
5. Using the DMM, find the potential differences across the source V_S and resistors R1, R2 and R3. Record the readings in Table 2.
6. Fill in Table 3.
7. Measure Vab. Calculate Vab using voltage division rule. Note down values in Table 4.
8. Now, disconnect the voltage source from the circuit and measure the total load resistance, Req of the circuit using DMM. Note down values in Table 4.

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Data Collection for Exp2:

Lab 1: Exp2
Group No. _____
Instructor's Signature _____

Table 1:

Resistance using colour coding					Resistance using DMM	% Error
Band 1	Band 2	Band 3	Band 4	Resistance ±tol		
Green-5	Blue-6	Red-2	Gold-5%	5600±5%	5.490k	1.96%
Orange-3	Yellow-4	Red-2	Gold-5%	3300±5%	3.217k	2.52%
Yellow-4	Violet-7	Red-2	Gold-5%	4700	4.640k	1.28%

Table2:

Experimental readings				Theoretical values			
V_s	V_{R1}	V_{R2}	V_{R3}	V_s	V_{R1}	V_{R2}	V_{R3}
15.35	6.34	3.73	5.38	15	6.18	3.64	5.18
% Error							
V_s		V_{R1}		V_{R2}		V_{R3}	
2.33%		2.58%		2.47%		3.86%	

Table 3:

Potential rise V_s	15.35	Are the voltage rises and drops equal?
Potential drops (V_{R1} + V_{R1} + V_{R3})	15.45	Rises Yes

Table 4

Experimental readings		Theoretical values	
V_{ab}	R_{eq}	V_{ab}	R_{eq}
11.88	13.36	11.36	13.6
% Error			
V_{ab}		R_{eq}	
4.58%		1.76%	

Vaishnavi Malhotra 12.2.2025

Lab report: Experiment 2

Title: Voltage division and Kirchoff's voltage law (KVL)

Objective:

Objective of this experiment is to understand and verify the voltage division rule and KVL by calculating theoretical and experimental values and comparing them for accuracy.

List of components:

- Trainer board
- Resistors (3.3, 4.7, 5.6 kΩ)
- Digital Multimeter (DMM)
- Connecting wire

Theory:

The voltage divider rule states that in a series circuit, the voltage across a resistor is given by,

$$V_x = E \times \frac{R_x}{R_T}$$

V_x = Voltage across the R_x resistor

R_T = Total resistance

E = Total applied voltage

KVL states that the sum of all voltage drops in a closed loop equals the total voltage supplied

$$V_S = V_{R_1} + V_{R_2} + V_{R_3}$$

V_S = Source voltage

V_{R_1}, V_{R_2} and V_{R_3} are the voltage drops across R_1, R_2, R_3 resistors.

From theory,

$R_1 = 5.6\ K\Omega$

$R_2 = 3.3\ K\Omega$

$R_3 = 4.7\ K\Omega$

$V_S = 15\ V$

$\therefore R_T = R_1 + R_2 + R_3$

$= 5.6 + 3.3 + 4.7$

$= 13.6\ K\Omega$

$\therefore$ Current, $I = \frac{V_S}{R_T}$

$= \frac{15}{13.6} = 1.1\ mA$

∴ Voltage across R_1

$$V_{R_1} = I R_1$$

$$= 1.1 \times 5.6$$

$$= 6.16V$$

∴ Voltage across R_2

$$V_{R_2} = I R_2$$

$$= 1.1 \times 3.3$$

$$= 3.63V$$

∴ Voltage across R_3

$$V_{R_3} = I R_3$$

$$= 1.1 \times 4.7$$

$$= 5.17V$$

Now if we compare them with experimental values then yes it follows KVL with slight error.

Discussion:

In this experiment, we have studied the Ohm's law, KVL and voltage divider rule using series circuit. We have learnt how circuits works and how to measure voltage, current and Ressistance using theory and DMM. For experiment 1 first we took 4 ~~Ressistance~~ Ressistors than measured their ressistance using colon band on them also with DMM. After that we recreated the circuits using those ressistor and trainer board. For experiment 1 ~~we~~ we verified that the circuit follows Ohm's ~~law~~ law and for experiment 2 we varified that the circuit follows KVL.

In conclusion, this lab was very helpful to increase our knowledge of circuits and different laws.