Faculty of Electrical & Electronics Engineering
BEE1133 Circuit Analysis I

LABORATORY 1

Title: Ohm's Law and Kirchhoff's Law

Taxonomy Level					
1. Knowledge	**2. Comprehension**	**3. Application**	**4. Analysis**	5. Synthesis	6. Evaluation
Mapping CO,PO,Domain,KI : CO1,PO1,C4,CO4,PO3,P4,CTPS4					
CO 01:Attribute the basic concepts of electrical quantities by using basic circuit laws (Ohm's law and Kirchhoff's law) and simplification of resistive circuits. PO 01: **(Knowledge)** Apply knowledge of mathematics, science, engineering fundamentals and ngineering specialization to the solution of complex engineering. C4 : Analysis CO 04: Construct DC and AC electric circuits to understand the concept of electrical quantities and verify circuit theorems. PO 05: Modern Tool Usage - Create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering activities, with an understanding of the limitations. P4 : Mechanism					

Learning Outcomes

At the end of the experiment, student should be able to:-

a) Explain the relationship between voltage and current base on Ohm's Law theorem.
b) Apply the Kirchhoff's Law to the circuit.

Equation

$$\% \text{ Error} = \frac{\textit{Theoritical Value - Measured Value}}{\textit{Theoritical Value}} \times 100$$

Part A

Instruction

1. Referring to Fig. 1 (R_1 = 1 kΩ), choose suitable value of resistor then measure the current and calculate error (between theory and measured value)
2. Increase the applied voltage in 1 V steps from 0 V up to 10 V
3. Plot the graph and obtain the slope of the graph to verify this law.

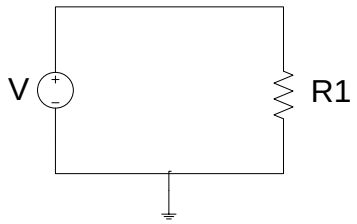

Figure 1

Question:

1. What is shape of the graph you obtain?
2. With this shape of graph, give your conclusion about the relationship between current and voltage for the resistor?
3. What is your observation from this experiment? State in detail your analysis.

Part B

Instruction

1. Referring to Fig. 2 (R_1 = 1 kΩ, R_2 = 470 Ω), choose suitable value of resistors connected in series.
1. Increase the applied voltage in 2 V steps from 0 V up to 10 V. Measure the voltage across each of the resistor in each step and calculate error (between theory and measured value)
2. Verify the Kirchhoff's voltage law.

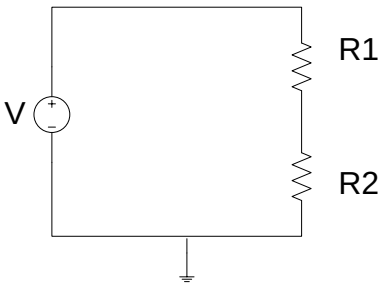

Figure 2

Question:

1. What is the value of R_1 and R_2 connected in series?
2. What is your observation from this experiment? State in detail your analysis.

Part C

Instruction

2. Referring to Fig. 3 (R_1 = 1 kΩ, R_2 = 470 Ω), choose suitable value of resistors connected in parallel.
3. Increase the applied voltage in 2V steps from 0V up to 10V. Measure the current and calculate the resistance in each step. Calculate error (between theory and measured value)

4. Verify the Kirchhoff's current law by measuring current across each resistor.

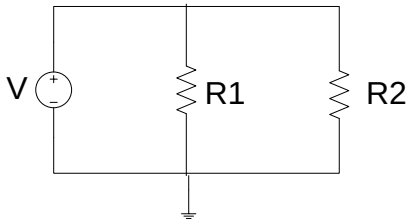

Figure 3

Question:

1. What is the value of resistance, R_1 and R_2 connected in parallel?
2. What is your observation from this experiment? State in detail your analysis.

Part D

Instruction

Referring to Fig. 4 (R_1 = 1 kΩ, R_2 = 100 Ω, R_3 = 150 Ω, R_4 = 10 kΩ), choose suitable values of resistors. Measure the current and voltage for each resistor and verify the result

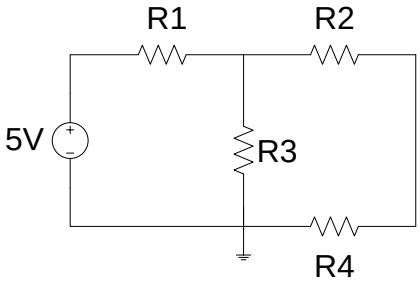

Figure 4

Question:

1. Calculate R_{eq} for Fig. 4?
2. Compare your calculation in Question 1 with your experimental results.
3. What is your observation from this experiment? State in detail your analysis.

Laboratory Session and Submission of Report

1. Please read the lab sheet given before the laboratory session.
2. The theoretical part should be done first before the laboratory session.
3. Construct your results into table, as example is shown in Figure below:-

Voltage(V)	Theoretical Value	Measured Value	Error (%)

4. Submission of report should be written in proper language and follow the instruction in the lab sheet. (Include: objective, procedure, hand calculation (theoretical), result, questions, discussion and conclusion.
5. Submit your report with the standard front page (given in website)

References

R. L. Boylestad and G. Kousourou, "Laboratory Solutions Manual to accompany Experiments in Circuit Analysis', Pearson Prentice Hall, 2004.