General Sir John Kotelawala Defense University
Faculty of Computing
Department of Computer Engineering

2.5

# BSc (Hons) in Computer Engineering
# Laboratory Practical
# EE1012- Electrical Engineering

# Experiment #5 Serial Parallel Networks and Kirchhoff's Laws

Name:
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Index No
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Intake
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Date
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Instructor Name and Signature:
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Comments ……

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**Grade**

## Objectives

- To identify series, parallel and series-parallel networks.
- To become familiar with the application of Kirchhoff's Laws

## Experiment background

From the experiments given so far, it should be easy for you to identify both series and parallel circuits. But there is another type of circuit that has branches, like parallel circuits, and series loads or elements, like series circuits. This is called a series-parallel network since it is a combination of the others.

There are many circuits that are so complex that they cannot be solved by just using the Ohm's Law. These circuits have many branches or many power sources, and Ohm's Law would be either impractical or impossible to use on them. Methods for solving complex circuits have been developed, and are based on the experiments of a German physicist, Gustav Kirchhoff. In 1857, Kirchhoff developed two conclusions, known as Kirchhoff s Laws, can be stated as follows:

- Kirchhoff's voltage law
- Kirchhoff's current law

## Pre-lab study

- Serial-parallel networks
- Kirchhoff's laws

## Equipment used

- KL-21001 module
- Breadboard module
- Jumper wires, crocodile clips and jacks
- 2x Resistors of 1 kΩ
- 1x Variable resistor of 5 kΩ

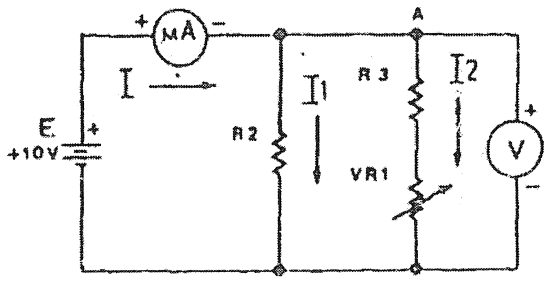


*Figure 2 - Circuit to test Kirchhoff's current law*

7. Adjust VR1 to 1 kΩ and calculate the total resistance R.
8. Measure and record the voltage of voltmeter.
9. Adjust VR1 to maximum and observe the reading of voltage on the voltmeter.
10. Adjust VR1 to 0 Ω. Measure and record the total current

## Procedure

1. Set the on the main unit KL-21001, and place the breadboard on it.
2. Complete the experiment circuit using jumper wires, resistors and the breadboard according to Figure 1 to test Kirchoffs voltage law. Use a 1 kΩ resistor as R1.

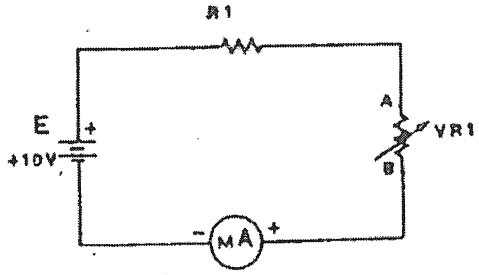


*Figure 1 - Circuit to test Kirchhoff's voltage law*

3. Adjust VR1 to 1 kΩ and apply +10V as voltage source. Calculate total resistance and current.
4. Insert the milliammeter in the circuit as shown in Figure 1, measure and record the current I.
5. Adjust VR1 to 500 Ω and repeat steps 3 and 4. Record the results in observation and readings section.
6. Construct the circuit as shown in Figure 2 to test the Kirchhoff's current law. Use 1 kΩ resistors for R2 and R3.

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| **Experiment** | Serial Parallel Networks and Kirchhoff's Laws | Official Seal |
| **Name of Student** | | |
| **Registration Number** | | |
| **Intake** | | |
| **Date of Performance** | | |

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| Marks | |

# Experiment Report

## Introduction

**Kirchhoff's Voltage law**

**Kirchhoff's Current Law**

## Calculations

**Step 3**

Calculate the total resistance R = R1 + VR1 = _____ W

Calculate the current I = _____ mA

**Step 5**

Total resistance R = R1 + VR1 = _____ W

Calculate the Current I = _____ mA

**Step 7**

R = _____ W

**Step 10**

Calculate the branch currents

I1 = _____mA

I2 = _____mA

Calculate the total current by using Kirchhoff's current law.

I = I1 + I2 = _____ mA

## Observations and readings

**Step 4**

I = _____ mA

**Step 5**

I = _____ mA

**Step 8**

E = _____ V

**Step 9**

Variation in E = _____ V

**Step 10**

I= _____ mA

## Discussion

**Step 3**

What is the type of the circuit of Figure 1 (series or parallel)

**Step 4**

Is there agreement between the measured current in step 4 and calculated current in step 3? If not why?

**Step 6**

What is the type of the circuit of Figure 2 (series or parallel)

**Step 8**

Is the measured voltage value equal to the voltage value supplied in step 3? Why?

**Step 9**

Does the voltage measured change when VR1 changes? Why?

**Step 10**

Is there agreement between your measured and calculated current values? Why?

What is the importance of Kirchhoff's laws?