MARMARA UNIVERSITY
FACULTY OF ENGINEERING

PHYS 1104

PHYSICS LABORATORY II

Kirchhoff's Laws

Section:
Group:
Instructure: Date:

	Department	Student Id Number	Name & Surname
1			
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1 Purpose

To verify Kirchhoff's Laws by comparing voltages obtained from a real circuit to those predicted by Kirchhoff's Laws.

2 Theory

A simple circuit is one that can be reduced to an equivalent circuit containing a single resistance and a single voltage source. Many circuits are not simple and require the use of Kirchhoff's Laws to determine voltage, current or resistance values. Kirchhoff's Laws for current and voltage are given by equations 1 and 2.

$$\sum_{Junction} I = 0, \quad Junction\ Law \tag{1}$$

$$\sum_{Loop} \Delta V = 0, \quad Loop\ Law \tag{2}$$

In this experiment, we will construct circuit with 4 resistors and two voltage sources. This circuit will not be simple thus Kirchhoff's Laws will be required to determine the current in each resistor. We will then use a digital multi-meter to obtain an experimental value for the voltage across each resistor in the circuits. Kirchhoff's Laws will then be applied to the circuits to obtain theoretical values for the current in each resistor. By applying Ohm's Law, we can then obtain a theoretical value for the voltage across each resistor. The experimental and theoretical voltages can then be compared by means of % error.

3 Equipments

1. Basic Electrical Experiment Set
2. 4 Resistors ($R_1 = 10\Omega, R_2 = 20\Omega, R_3 = 30\Omega, R_4 = 10\Omega$)
3. Digital Multi-Meter
4. Variable Power Supply
5. Wire Leads

4 Experimental Procedure

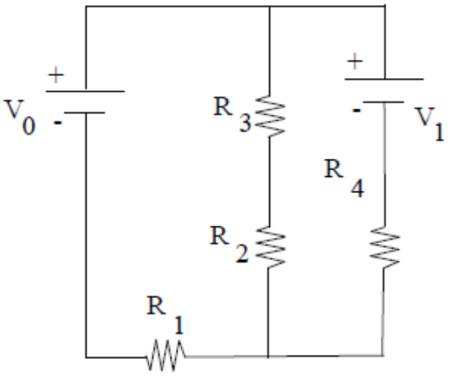

Figure 1: Circuit diagram for Kirchhoff's Law

1. Using the basic electrical experiment set, the 4 resistors, the variable power supply, and the wire leads; construct the circuit shown in Figure 1.
2. Turn on the power suppliers. Adjust the voltages $V_0 = 5.0$ V and $V_1 = 6.0$ V.
3. Connect the multi-meter across each of the 4 resistors. Record these 4 values of voltage in the data table.
4. Connect the multi-meter near each of the 4 resistors. Record these 4 values of current in the data table.
5. Turn the power supply off and disconnect the circuit.

5 Analysis

1. For the circuit, use equations 1 and 2 to write a system of linear equations that may be solved for the current in each branch of the circuit. Then, solve the system to obtain a theoretical value for each current. Show your work!
2. Using the currents obtained in step 1 of the analysis; apply Ohm's Law to determine the theoretical voltage across each resistor.
3. Compare the theoretical voltages obtained in step 2 of the analysis to those measured in the actual circuit.
4. Record the theoretical voltages, the experimental voltages, and the % errors in the results table.

6 Results

	$V_{theoretical}$	$V_{experimental}$	% Error
R1			
R2			
R3			
R4			

	$I_{theoretical}$	$I_{experimental}$	% Error
R1			
R2			
R3			
R4			