Experiment 4
Kirchhoff's Laws

Introduction

Kirchhoff's voltage law (KVL) states that the algebraic sum of all voltages around any closed path equals zero. The Kirchhoff's current law (KCL) states that the algebraic sum of all the currents at a node is zero (current entering a node has opposite sign to the current leaving the node). This experiment studies these two laws using *Multisim Electronics Workbench,* then with actual hardwired circuit.

Objectives

1. Voltage current measurement in a dc circuit
2. Verification of Kirchhoff's voltage and current laws.

Materials

One dc power supply
One multimeter
Assorted carbon resistors

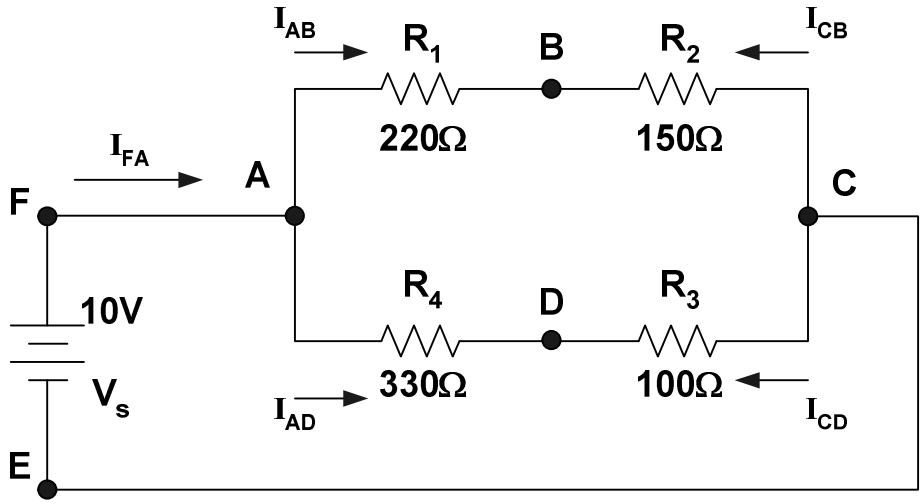

Figure 1: Resistive circuit

Procedure

1. Construct the circuit shown in Figure 1 using *Multisim Electronics Workbench.*
2. Measure the voltages V_{AB}, V_{BC}, V_{AD}, V_{DC}, V_{BD}, and V_{AC}. Enter the values in Table 1. Note the polarities of the voltages.
3. Measure the currents I_{AB}, I_{CB}, I_{AD}, I_{CD} and I_{FA} and enter the values in Table 2. Note the polarity (sign) of the currents.

4. Calculate the voltages around the following loops and record them in Table 4.

ABCEFA, ABDA, BDCB, ABCDA

5. Verify KCL by adding the currents at nodes A, B, C, D. Enter your results in Table 3.
6. Construct the circuit in Figure 1 with hardware components. Repeat steps 2-5. Enter you results in Tables1-4. Considering the Workbench results as the base compute the percentage errors.

Table 1: Voltage measurement

	V_{AB}	**V_{BC}**	**V_{AD}**	**V_{DC}**	**V_{BD}**	**V_{AC}**
Workbench						
Hardwired						
% Error						

Table 2: Current measurement

	I_{AB}	**I_{CB}**	**I_{AD}**	**I_{CD}**	**I_{FA}**
Workbench					
Hardwired					
% Error					

Table 3: Sum of currents at nodes

	A	**B**	**C**	**D**
Workbench				
Experiment				
% Error				

Table 4: Voltages around loop

	ABCEFA	ABDA	BDCB	ABCDA
Workbench				
Experiment				
% Error				

Answer the following Questions:

1. Do the experimental and theoretical values of voltages and currents agree?

2. Give possible reasons for any discrepancies.

3. Are KVL and KCL verified?

4. Give reasons for any discrepancies.

Any other observations or comments