Electric Circuits Lab. 1
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Experiment No. 7

Mesh Analysis

1. Introduction

1.1 Objective:

Solve a circuit using mesh analysis.

1.2 Components

1. DC circuit training system
2. Set of wires.
3. DC power supply
4. Digital multimeter.

1.3 Theory

The method of analysis to be described is called mesh analysis. The term mesh is derived from the similarities in appearance between the closed loops of a network and a wire mesh fence. To solve an N mesh circuit, a set of N simultaneous equations are needed. There are several ways to derive a solution (i.e. Matrix algebra). Essentially, the mesh-analysis approach simply eliminates the need to substitute the results of Kirchhoff's current law into the equations derived from Kirchhoff's voltage law. It is now accomplished in the initial writing of the equations. The systematic approach outlined below should be followed when applying this method:

1. Assign a distinct current in the clockwise direction to each independent, closed loop of the network. It is not absolutely necessary to choose the clockwise direction for each loop current. In fact, any direction can be chosen for each loop current with no loss in accuracy, as long as the remaining steps are followed properly. However, by choosing the clockwise direction as a standard, we can develop a short and method for writing the required equations that will save time and possibly prevent some common errors.

2. Indicate the polarities within each loop for each resistor as determined by the assumed direction of loop current for that loop. Note the requirement that the polarities be placed within each loop.

3. Apply Kirchhoff's voltage law around each closed loop in the clockwise direction. Again, the clockwise direction was chosen to establish uniformity and prepare us for the method to be introduced in the next section

a. If a resistor has two or more assumed currents through it, the total current through the resistor is the assumed current of the loop in which Kirchhoff's voltage law is being applied, plus the assumed currents of the other loops passing through in the same direction, minus the assumed currents through in the opposite direction.

b. The polarity of a voltage source is unaffected by the direction of the assigned loop currents.

4. Solve the resulting simultaneous linear equations for the assumed loop currents.

2. Experiment procedure:

1. Using the DC circuit trainer, Connect the circuit shown below in Figure (1)

Take V_1= 6 volt , V_2= 9 volt. R_1= 81kΩ , R_2= 470Ω , R_3= 5 kΩ

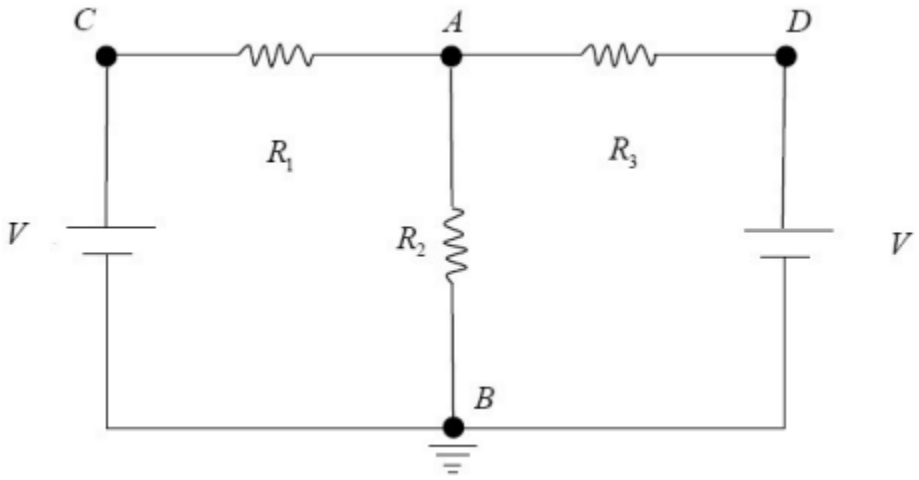

Figure (1)

2. Using the multimeter to measure the values of current of each resistor in circuit and record it in the table below.

	1kΩ	470Ω	5kΩ
I (mA)			

3.Using the multimeter to measure the voltage to each node and record it in the table below

	Vab	Vac	Vad
V (Volt)			

3. Discussion:

1. Discuss the obtained measured results and compare it with the theoretical analysis.

2. Why KVL is used in Mesh analysis?

3. Write the mesh equations for the branch currents in the circuit shown in Figure (2).

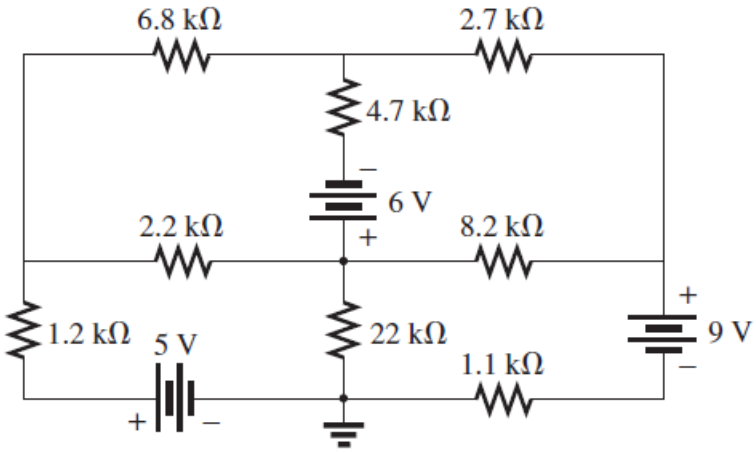

Figure (2)