Experiment No. 6

Nodal Analysis

1. Introduction

1.1 Objective:

To measure the voltages and currents present in the circuit using Nodal analysis.

1.2 Components

1. DC circuit training system
2. Set of wires.
3. DC Power supply
4. Digital A.V.O. meter

1.3 Theory

A node is defined as a junction of two or more branches. If we now define one node of any network as a reference (that is, a point of zero potential or ground), the remaining nodes of the network will all have a fixed potential relative to this reference. For a network of N nodes, therefore, there will exist (N-1) nodes with a fixed potential relative to the assigned reference node. Equations relating these nodal voltages can be written by applying Kirchhoff's current law at each of the (N-1) nodes. To obtain the complete solution of a network, these nodal voltages are then evaluated in the same manner in which loop currents were found in loop analysis. The nodal analysis method is applied as follows:

1. Determine the number of nodes within the network.
2. Pick a reference node, and label each remaining node with a subscripted value of voltage: V1, V2, and so on

3. Apply Kirchhoff's current law at each node except the reference.

Assume that all unknown currents leave the node for each application of Kirchhoff's current law. In other words, for each node, don't be influenced by the direction that an unknown current for another node may have had. Each node is to be treated as a separate entity, independent of the application of Kirchhoff's current law to the other nodes

4. Solve the resulting equations for the nodal voltages. A few examples will clarify the procedure defined by step 3. It will initially take some practice writing the equations for Kirchhoff's current law correctly, but in time the advantage of assuming that all the currents leave a node rather than identifying a specific direction for each branch will become obvious.

2. Experiment procedure:

1. Using the DC circuit trainer, Connect the circuit shown below in Fig. 1.

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

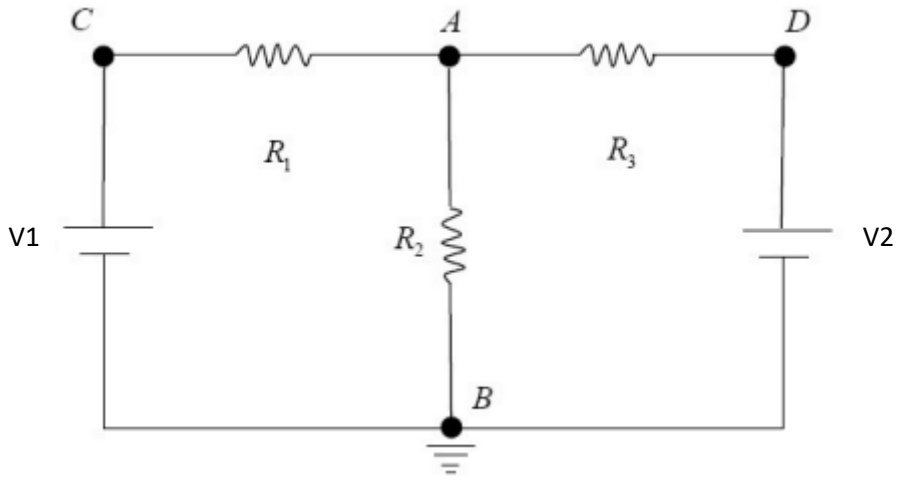

Figure (1)

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 avometer to Measured 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 KCL is used in nodal analysis?

3. In the network of Figure (2), use nodal analysis to determine :

(a) The voltage at nodes *B* and *C*;

(b) The current I_{R3};

(c) The magnitude of the active power dissipated in the 820 Ω resistance.

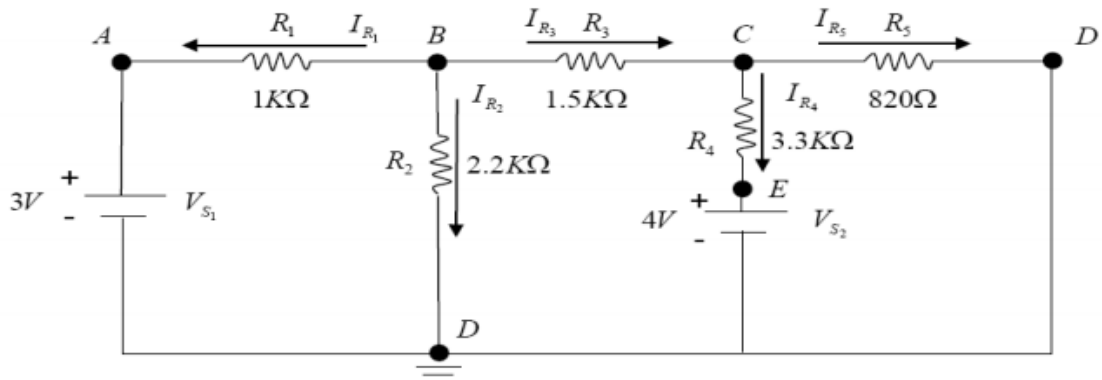

Figure (2)