

Experimental Verification of Network Theorems

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1 Network Theorems

Network theorems are analytical method used to convert a complex circuit into a simple equivalent circuit.

1.1 Thevenin's Theorem

Any linear complex circuit seen from any two terminals may be represented by a single voltage source (Thevenin Voltage, V_{th}) in series with an impedance (Thevenin Impedance, Z_{th}) where Thevenin voltage is the open circuit voltage between that terminals and Thevenin impedance is equal to the impedance seen from that terminals, after short-circuiting all independent ideal voltage sources and opening the independent ideal current sources.

1.2 Norton's Theorem:

Any linear complex circuit seen from any two terminals may be represented by a single current source (Norton Current, I_N) in parallel with an impedance (Norton Impedance, Z_N), where Norton current is the short circuit current between that terminals and Norton impedance is equal to the impedance seen from that terminals, after short-circuiting all independent ideal voltage sources and opening the independent ideal current sources. The Thevenin's and Norton's theorems are dual and applicable to linear circuits only.

1.3 Objective of the Experiment:

To verify Thevenin and Norton theorem by using a given circuit.

1.3.1 Circuit diagram and working formulae:

Figure 1 shows the working circuit for verification of Network theorems. It is an unbalanced resistive Wheatstone bridge network having power supply with ignorable internal resistance connected to load resistance R_L .

Thevenin's Theorem verification:

Let us consider the the terminals B and D between which we apply Thevenin theorem. The Thevenin voltage measured across B and D, can be written as

$$V_{th} = V_{oc} = \left(\frac{R_2}{R_1 + R_2} \times \frac{R_3}{R_3 + R_4} \right) \quad (1)$$

Thevenin resistance(c.f. figure:2) R_{th} is given by,

$$R_{th} = \frac{R_1 \cdot R_2}{R_1 + R_2} + \frac{R_3 \cdot R_4}{R_3 + R_4} \quad (2)$$

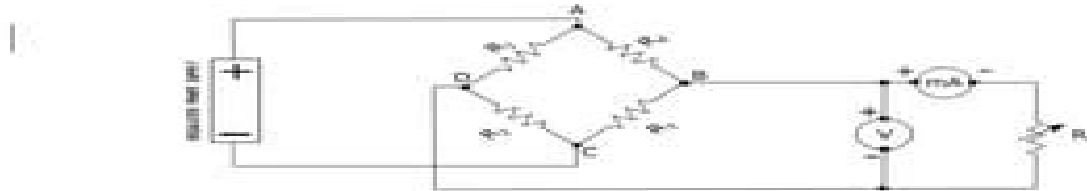


Figure 1: Schematic Circuit diagram for study of Network Theorems

Network Theorem Lab Manual

Emmett Dulaney



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