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EE152 Basic Electrical Science Lab

Experiment – 3

Verification of Network Theorems

1. A. Introduction:

This session makes students to understand various network theorem – Superposition, Thevenin and Norton theorems and to verify through a Simulation platform, MATLAB/Simulink.

1. B. Objectives:

a. Acquire good knowledge on the above mentioned network theorem.

b. Verification of the four theorem in MATLAB/Simulink Platform

1. C. Theory: Refer to the notes or necessary materials mentioned in EE151 course.

1. D. Statement of Experiments:

This session consists of four parts. [V= 100 V, $R_x = (10 \times x)$ Ω, I = 50 A], Consider, R_5 as ***Load Resistance***.

a. Using the circuit diagram shown in Fig. 3.a, verify ***Superposition Theorem*** in Matlab/Simulink platform.

b. Using the circuit diagram shown in Fig. 3.a, verify ***Thevenin Theorem*** in Matlab/Simulink platform.

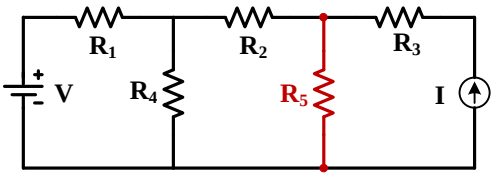

Fig. 3.a

c. Using the circuit diagram shown in Fig. 3.a, verify ***Norton Theorem*** in Matlab/Simulink platform.

1. E. Procedure: The procedures for the ***four parts*** are mentioned here.

a. Part 1.D.a : Superposition Theorem

i. Convert the circuit shown in Fig. 3.a into experimental circuit (which includes necessary measuring instruments).

ii. Construct the experimental circuits in MATLAB/Simulink domain, and simulate it.

iii. Based on the simulation, fill up the Table-3.1 to verify ***Superposition Theorem***.

b. Part 1.D.b : Thevenin's Theorem

i. Convert the circuit shown in Fig. 3.a into experimental circuit (necessary measuring instruments are to be incorporated in the circuit).

ii. Construct the experimental circuits in MATLAB/Simulink domain. Here, the file has to be run two times: at first it has to run to find out the open circuit voltage across the load terminal and it has to run second time to find out Thevenin's resistance across the load terminal.

iii. Based on the simulation, prepare an appropriate table and fill up it to verify ***Thevenin's Theorem***.

c. Part 1.D.c : Norton's Theorem

i. Convert the circuit shown in Fig. 3.a into experimental circuit (necessary measuring instruments are to be incorporated in the circuit).

ii. Construct the experimental circuits in MATLAB/Simulink domain. Here, the file has to be run to find out the short circuit voltage across the load terminal.

iii. Based on the simulation, prepare an appropriate table and fill up it to verify ***Norton's Theorem***.

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Table – 3.1 for Superposition Theorem

Observation No.	Applied Forcing Function		Load Voltage (volts) (V_L) due to all forcing Function		Load Voltage (volts) (V_{LV}) due to V only		Load Voltage (volts) (V_{LI}) due to I only		$V_{LV}+V_{LI}$ (volts)	
	Applied Voltage (V) in volts	Applied Current (I) in A	Theoretical	Simulated	Theoretical	Simulated	Theoretical	Simulated	Theoretical	Simulated
1	100	50								
2										
3										
4										

1. F. Assignments:

1. Replace constant voltage source by variable voltage source (sinusoidal source with the same magnitude, ramp input with slope 1) in Fig. 3.a, do all the simulation again.
2. Using circuit shown in Fig. 3.b, do the experiments again. Consider, the load resistance mentioned in red colour.

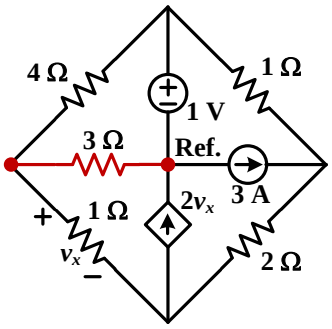

Fig. 3.b