

EXPERIMENT 4

NETWORK THEOREMS THEVENIN, NORTON AND SUPERPOSITION

OBJECTIVE: The purpose of this experiment is to verify experimentally the important network theorems such as Thevenin's, Norton's and Superposition

PRELIMINARY WORK

P1 Given the network in Figure 4.1, find the voltage V and the current I by using the superposition theorem. Let $V = V' + V''$ ($I = I' + I''$) where V' (I') is generated by the source E_1 alone, and V'' (I'') is generated by the source E_2 alone.

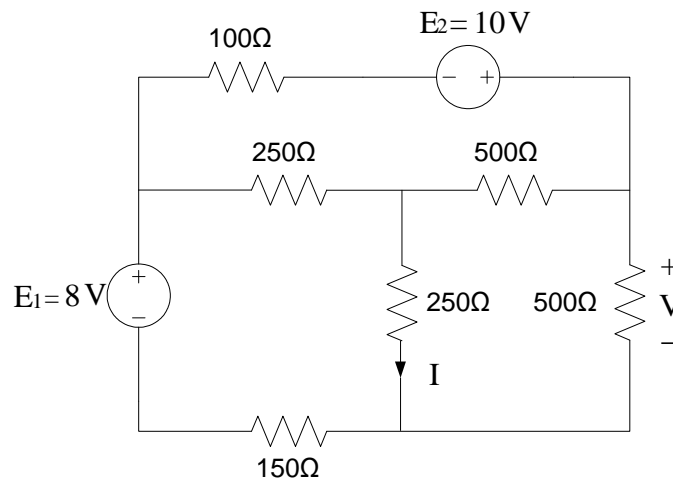


Figure 4.1

P2 Consider the same network shown in Figure 4.2 which the same network is given in P1. Calculate and draw the Thevenin's equivalent circuit of this network external to 500Ω resistor R_L . Using the equivalent circuit, find the voltage and current associated with R_L .

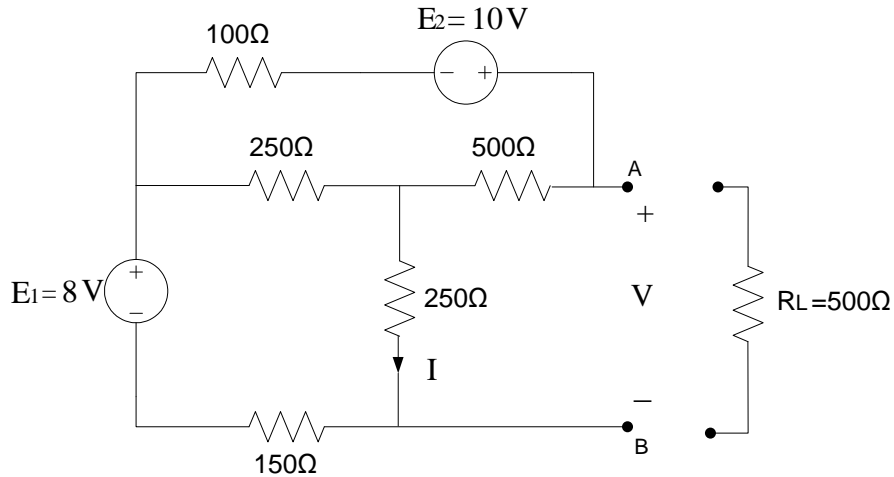


Figure 4.2

P3 Obtain the Norton's equivalent circuit of the network given in Figure 4.2 from its Thevenin's equivalent circuit

EQUIPMENT

Digital Multimeter (DMM)
 Avometer (AVO8)
 Power Supply
 Resistors

EXPERIMENTAL WORK

E1 Set up the circuit in Figure 4.1. Replace E_2 by a short circuit and measure the voltage V' and the current I' generated by the source E_1 . Be careful about the polarities of the measured voltages and currents

Replace E_1 by a short circuit and measure the voltage V'' and the current I'' generated by the source E_2 .

Connect both of the sources simultaneously, and measure the voltage V and the current I .

Check whether the superposition theorem is satisfied, $V = V' + V''$, $I = I' + I''$.

E2 Set up the circuit shown in Figure 4.2 Record the voltage V and current I . Find the values of the Thevenin voltage and the Thevenin resistance by using a voltmeter and an ohmmeter, respectively. Check the results with the ones obtained in P2.

CAUTION: An ohmmeter is never connected to a circuit activated by a source.

E3 Find the Norton's equivalent circuit of the 2-terminal network considered in Figure 4.2 experimentally. Do the results fit with the results found in P3

CONCLUSION

C1 How do you find the Thevenin's or Norton's resistance without using an ohmmeter?

C2 If a two terminal network contains dependent sources, is it possible to measure its Thevenin's resistance by using an ohmmeter only, why?

C3 Can you describe a method to find the Thevenin's equivalent circuit of a resistive network by using a voltmeter and a variable resistor only?