

Laboratory 4

Thévenin Equivalent Circuits

(Round your calculation and simulation results to 2 decimal places if necessary)

Objectives

- Verify Thévenin Theorem.
- Study and verify the different methods to find V_{Th} and R_{Th} .

Equipment and Components

- A computer/laptop
- Matlab software

Preliminary

1. Refer to Chapter 4 of the textbook if necessary.
2. Calculate all theoretical solutions in Tables 1, 2, and 3.

Procedure

1. Open Matlab.
2. Create a Simulink model of the circuit as shown below by following the procedures in Lab 1.
3. Measure the voltage across terminals **a** and **b** and then fill in your simulation result in Table 1.

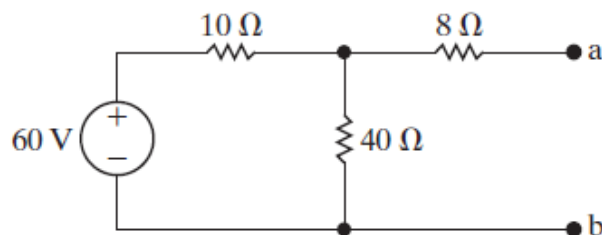


Table 1 Thevenin Equivalent Circuit

	Theoretical Solution	Simulation Result
V_{Th} (V)		

Is the simulation result consistent with your calculation result?

- Remove the 60 V voltage source and then add a test voltage source across the terminals **a** and **b** in the above circuit. Create a Simulink model of the following circuit.
- Try the different values of the test source as shown in Table 2 below, measure the I_{test} and fill them in in Table 2
- Calculate R_{Th} by using $R_{Th} = \frac{V_{test}}{I_{test}}$.

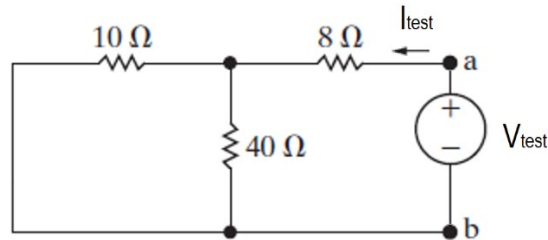


Table 2 Test Voltage Source and Thevenin Resistance

V_{test}		1 V	5 V	10 V	100 V
I_{test}	Theoretical solutions				
	Simulation results				
R_{Th}	Theoretical solutions				
	Simulation results				

Based on your results and observations, do the values of the test source affect the value of R_{Th} ?

- Short the terminals **a** and **b** and then Create a Simulink model of the following circuit.
- Measure the current i_{sc} and fill in the simulation results in Table 3.

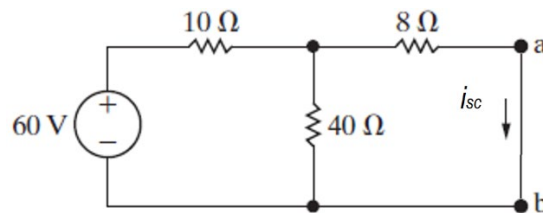
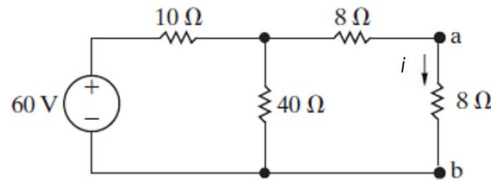


Table 3 Short Circuit Current and Thevenin Resistance

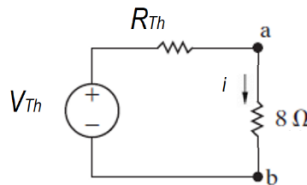
	Theoretical Solutions	Simulation Results
i_{sc}		
V_{Th} (from Table 1)		
R_{Th}		

Is the value of R_{Th} found in Table 3 consistent with the one found in Table 2? Describe the difference between the two methods to find R_{Th} .

9. Add an $8\ \Omega$ resistor to the circuit as shown in the circuit below and create a Simulink model find current in the resistor.



10. Add the $8\ \Omega$ resistor to the Thevenin equivalent circuit you found as shown in the circuit below and calculate the current i .



Are the two currents found in Step 9 and Step 10 the same? What is your conclusion about your findings?

Questions and conclusions

- Summarize your findings and explanations in response to the questions posed in this lab.