Department of Computer and Electronics Engineering Technology
CEET 1140
Lab 5

Title: Thévenin and Norton Equivalent Circuits.

Objective: The student will be able to find the Thévenin and Norton
equivalents of a series-parallel circuit both analytically and
by taking measurements.

Equipment: Power Supply
Digital Multimeter
Proto Board

Parts: 1 47 Ω Resistor, ¼ watt
1 100 Ω Resistor, ¼ watt
1 160 Ω Resistor, ¼ watt

Preparation: Write the title and a short description of this lab in your lab book.
Make sure the page is numbered and make an entry in the table of
contents for this lab.

Measure the actual resistance of your resistors (unless you have
already done so) and use them in place of the standard resistor
values throughout the remainder of the lab.

Analyze the circuit below to find the voltage V_{ab}. This is the
Thévenin voltage of the circuit. Find the Thévenin resistance by
shorting out the voltage source and computing the resistance
across terminals **a** and **b**.
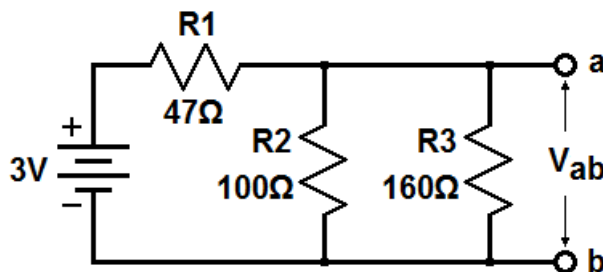
To find the Norton equivalent circuit, short out terminals **a** and **b**,
and compute the current through that short circuit. This is the
Norton current of the circuit. The Norton resistance is the same as
the Thévenin resistance you have already computed.

Consider the relationship between the Thévenin voltage, the Norton current and the Thévenin/Norton resistance. Can you find the Thévenin equivalent circuit knowing only the Thévenin voltage and the Norton current?

Devise an experiment that you can perform in the lab on an unknown resistor network to find its Thévenin and Norton equivalents.

Bring your lab notebook and the parts, above, to your lab period.

Set up: Using a voltmeter, adjust your power supply as close to 3V as possible. Turn off the power supply and construct the series-parallel circuit that you analyzed earlier.

Procedure: Apply power to your circuit. Use a voltmeter to measure V_{ab}. Does this agree with the Thévenin voltage you computer earlier? If it does not, go back and check your circuit. DO NOT proceed to the next step until you measure the correct Thévenin voltage.

Disconnect the voltmeter and replace it with an ammeter. This effectively shorts terminals **a** and **b**, and it also measures the current through that short circuit. Does the current match the Norton current you computed earlier?

Find the Thévenin and Norton equivalent circuits of your series-parallel network using only the measurements you take (or have taken) in the lab.

Turn off the power. Configure the multimeter to be a voltmeter.

The lab instructor has an unknown "black box" resistor network that you are to analyze. Take whatever measurements you need, then find the equivalent Thévenin and Norton circuits for that resistor network.

Conclusions: In the conclusion section, write a short summary of what you did and what you learned. Make sure your conclusion answers the following questions:

From the measurements you took, can you reproduce the schematic of the resistor network in the black box? Explain.

From the measurements you took, can you produce a resistor network that behaves exactly like the resistor network in the black box?