ECET 102/CPET101
Lab 7
Thevenin's Theorem

By Prof. Paul I. Lin

Required Devices & Equipment:

Resistors: 1kΩ x 2, 820Ω x 1, 100Ω x 1
Potentiometer 10kΩ x 1
Bread board x 1 with wires, wire strippers and cutters
Variable Power Supply x 1
Digital Multimeter (DMM) x 1

Objectives:

1. Learn to find a Thevenin equivalent circuit from a more complex circuit using circuit circuits analysis.
2. Using a computer simulation to verify the Thevenin equivalent circuit.

Procedure:

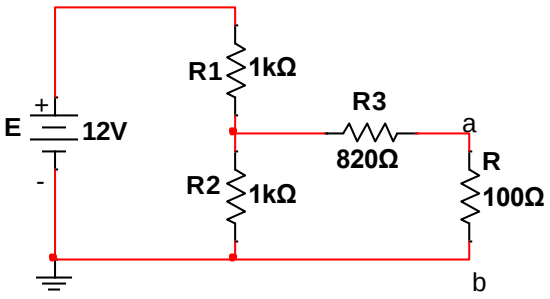

Figure 1. The Circuit for Lab 7

Part 1. Calculation
For the circuit shown in Figure 1, perform the following calculations:

(a) Find the current through, and the voltage across the resistor, R.

1) Calculate the total circuit resistance RT = ((R3+R) || R2) + R1) = _____ Ohms.
2) Calculate the total circuit current It = E/RT = _____ mA.
3) Calculate the voltage drop across R2, namely V2 = E – It * R1 = _____ Volts.
4) Calculate the current passing through R3 and R, namely Ir = V2/(R3 + R) = _____ mA.
5) Calculate the voltage drop across R, called Vab = Ir * R = _____ Volts

(b) Find the Thevenin equivalent circuit for the network external to the resistor, R,, namely Eth and Rth.

1) Remove R from the circuit, as shown in Figure 2, then find open circuit voltage across a and b points called Vab = Eth = E * (R1 / (R1+ R2)) = _____ Volts.

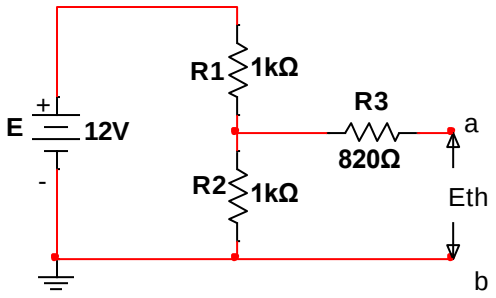

Figure 2. Subcircuit for finding Eth

2) With E removed, as shown in Figure 3, find the circuit resistance called Rth = (R1 || R2) + R3 = _____ Ohms.

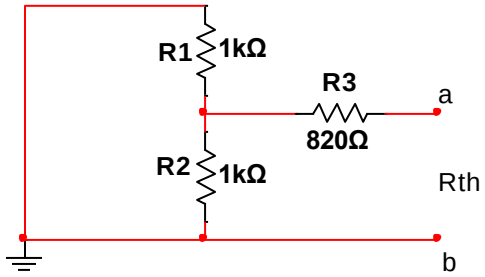

Figure 3. Subcircuit for finding Rth

(c) Using the values calculated for Eth and Rth, as shown in Figure 4, calculate the current through, and voltage across the resistor, R.

Ir = Eth/(Rth + R) = _____ mA

Vab = Ir * R = _____ Volts

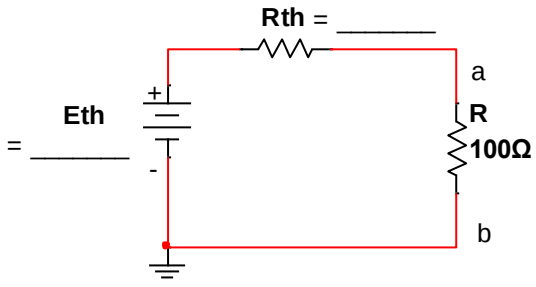

Figure 4. Thevenin equivalent circuit

(d) Compare the results from (a) and (b)

Part 2. Computer Analysis

(a) Construct the circuit shown in Figure 4, using Multisim.
(b) Add an ammeter and a voltmeter to measure the current through R, and voltage across.

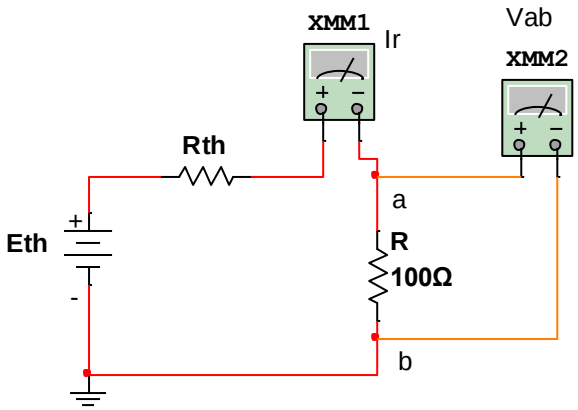

Figure 5. Thevenin equivalent circuit using Multisim Simulation

Part 3. Measurement

a) Construct the circuit shown in Figure 1, and measure the current through and the voltage across R.

Ir = _____ mA.

Vab = _____ Volts

b) Using the values of Eth and Rth calculated in Part 1, duplicate these values with the power supply and a potentiometer.

c) Measure the current through and voltage across the resistor R.

Ir = _____ mA

Vab = _____ Volts

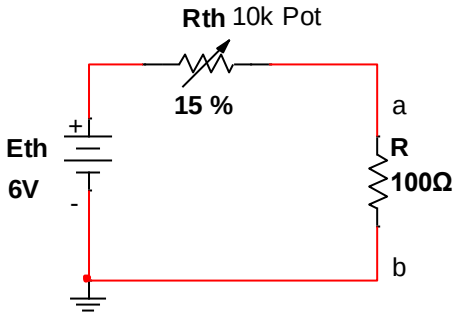

Figure 6. Thevenin equivalent circuit for measurement

Part 4. Compare the three methods of calculation, computer analysis and measurement. Note any differences in the results.