

ECET 102/CPET101
Computer Simulation Lab
Superposition and Thevenin/Norton Analysis

Objectives:

1. Perform calculations using superposition.
2. Verify the superposition calculations using computer simulation (Multisim)
3. Find a Thevenin equivalent circuit from a more complex circuit using circuit analysis.
4. Use computer simulation to verify the Thevenin equivalent circuit.

General Information:

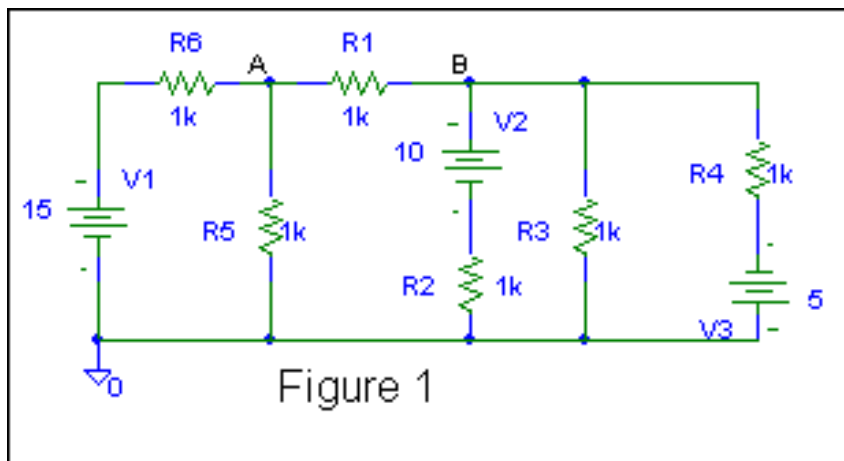
Superposition and Thevenin equivalent circuits have been covered in previous lab and homework assignments. This computer lab reinforces the previous concepts and calculations.

Part 1.

Superposition: For the circuit shown in Figure 1:

a. Draw each circuit below and **calculate** the following and **show** your work below:

(Remember, you must analyze 3 separate circuits)



Draw the 3 circuits to analyze below, do the analysis on this and the top of the next page, and **write** your results on the next page.

Write your calculated values below: [Use Superposition]

$$V_{A(15V \text{ Bty})} = \underline{\hspace{2cm}} \quad V_{B(15V \text{ Bty})} = \underline{\hspace{2cm}}$$

$$V_{A(10V \text{ Bty})} = \underline{\hspace{2cm}} \quad V_{B(10V \text{ Bty})} = \underline{\hspace{2cm}}$$

$$V_{A(5V \text{ Bty})} = \underline{\hspace{2cm}} \quad V_{B(5V \text{ Bty})} = \underline{\hspace{2cm}}$$

$$V_{A(\text{Total})} = \underline{\hspace{2cm}} \quad V_{B(\text{Total})} = \underline{\hspace{2cm}}$$

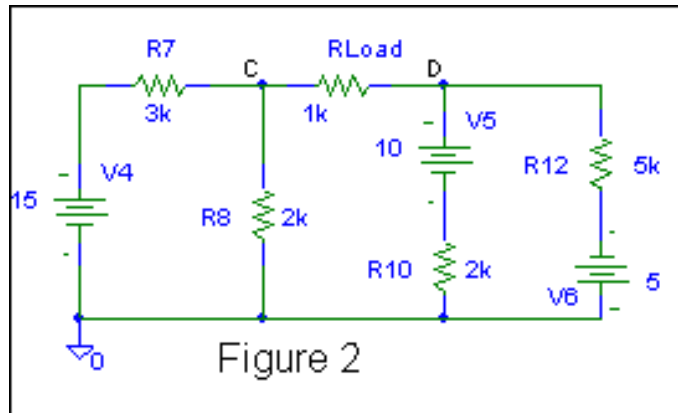
b. Verify $V_{A(\text{Total})}$ and $V_{B(\text{Total})}$ using Pspice or EWB and turn in the printout that shows the solution along with this lab. Fill in the computer calculated values below:

$$V_{A(\text{Total})} = \underline{\hspace{2cm}} \quad V_{B(\text{Total})} = \underline{\hspace{2cm}}$$

c. Comment on the results:

Part 2. Thevenin and Norton Equivalent Circuits:

a. Calculate the Thevenin voltage and resistance with respect to R_{Load} for the circuit shown in Figure 2:
Show your work below.



Write the calculated values below:

(Remember that $V_{Thev} = \text{Voltage from node C to node D which is } V_C - V_D$)

$V_{Thevenin} = \underline{\hspace{4cm}}$ $R_{Thevenin} = \underline{\hspace{4cm}}$

Sketch the Thevenin equivalent circuit below:

Calculate the Norton equivalent current and resistance. **Show** your work and **write** the calculated values below:

$I_{Norton} = \underline{\hspace{4cm}}$ $R_{Norton} = \underline{\hspace{4cm}}$

Sketch the Norton equivalent circuit below:

b. Verify your calculations using Pspice/EWB and turn in the printout showing how you found the Thevenin equivalent voltage and resistance from the circuit using the computer program.

c. Find the power to a $1\text{k}\Omega$ load resistor using the Thevenin equivalent circuit and **write** the result below: (remember to include units)

$$P_{1k} = \underline{\hspace{4cm}}$$

d. Find the load resistance for maximum power transfer and the power dissipated in this resistor

$$P_{(\text{MaxPowerTransfer})} = \underline{\hspace{4cm}}$$