Lab 1: Circuit Review

EE316-08 Spring 2021

Part 1: Resistive Circuits, Linear Scale Ohmmeter

- **Purpose:** The goals of this laboratory are to verify Ohm's Law, Kirchhoff's Voltage Law, and Kirchhoff's Current Law. In addition, the operational ranges for voltages and currents as related to component tolerances will be explored.

Ohm’s Law

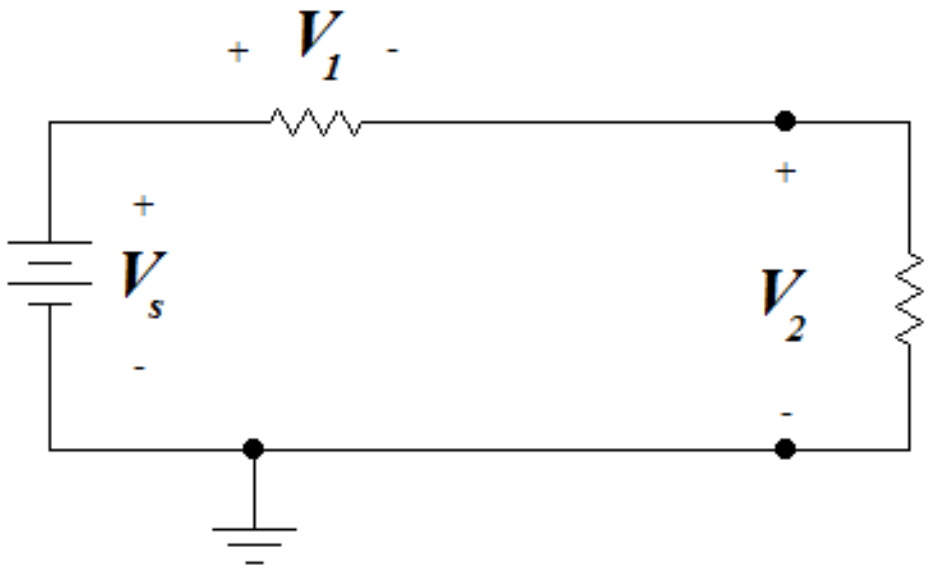
- Ohm’s Law states that the **voltage across a linear resistor is directly proportional to the current flowing through the resistor**.

Mathematically, the voltage, current, and resistance are related by

$$V = I*R$$

Kirchhoff's Voltage Law (KVL)

- Kirchhoff's Voltage Law states the algebraic **sum of the voltages around any closed loop in a circuit must be equal to zero**.



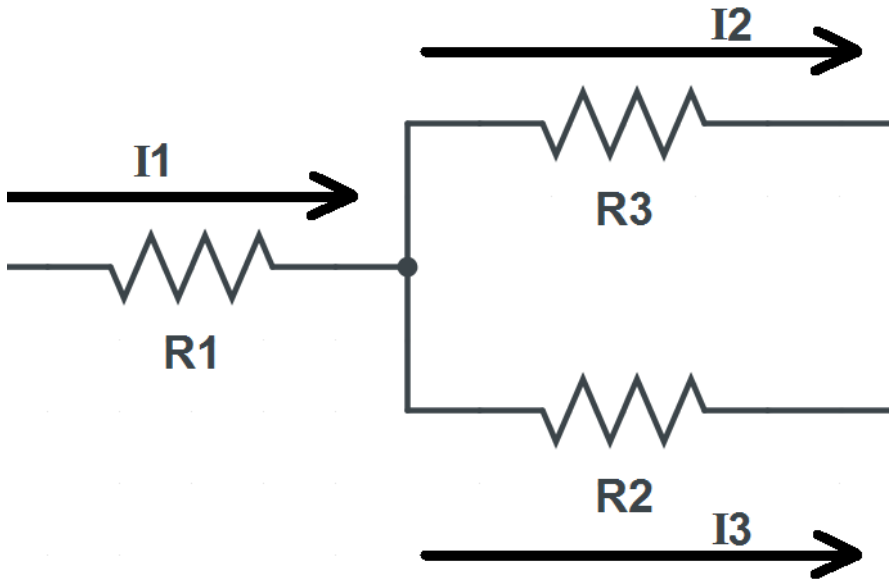
$$V_s = V_1 + V_2$$

Or

$$-V_s + V_1 + V_2 = 0$$

Kirchhoff's Current Law (KCL)

- Kirchhoff's Current Law states that the algebraic **sum of the currents entering a node must be equal to the algebraic sum of the currents leaving the node**.

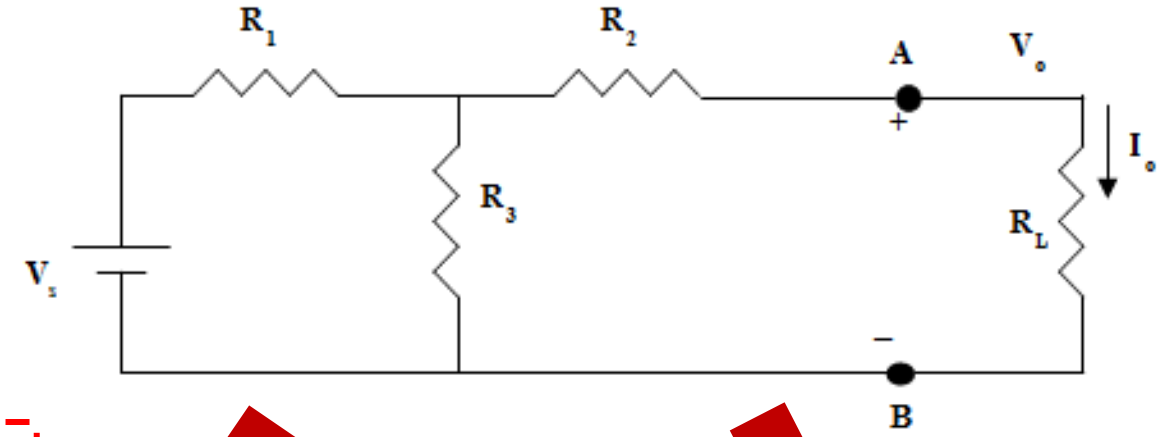


$$I_1 = I_2 + I_3$$

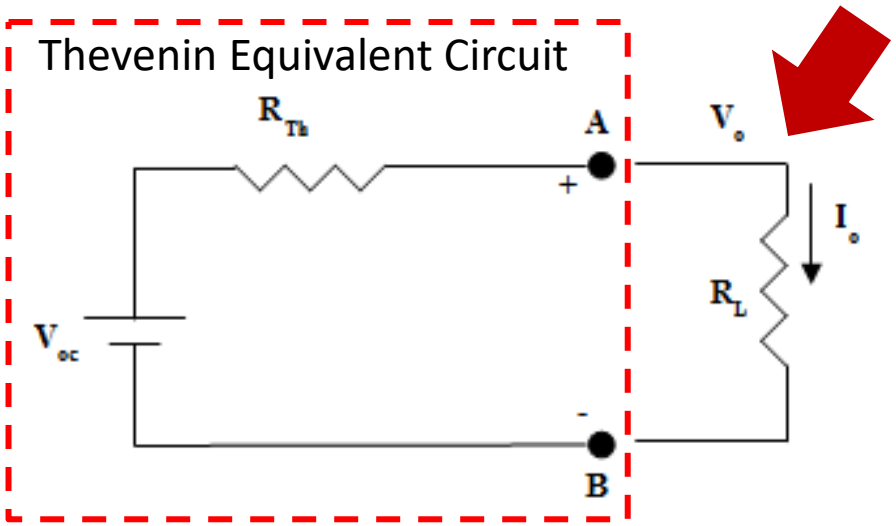
Part 2: Norton and Thevenin Equivalent Circuits

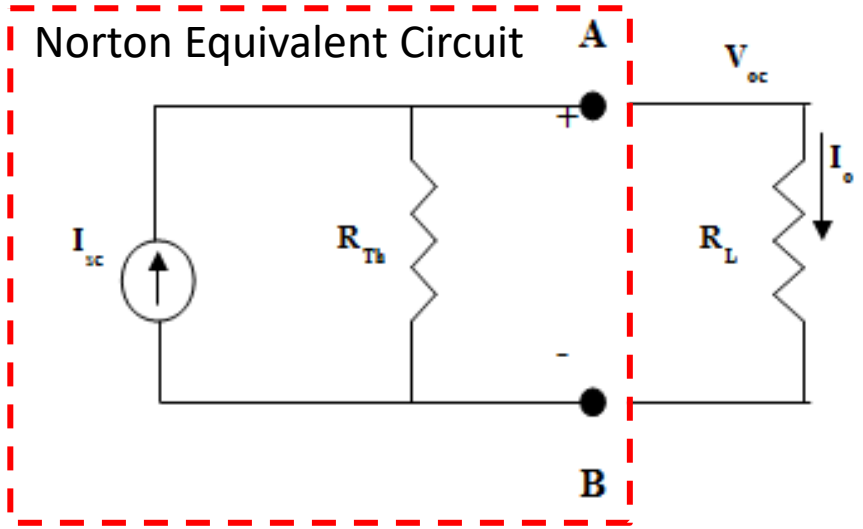
- **Purpose**: The goals of this laboratory are to demonstrate the equivalence between a multiple resistive network and its' Thevenin or Norton equivalent circuits. The concepts of load line and maximum power transfer will also be introduced.

Norton and Thevenin Equivalent Circuits



* The advantage of applying Thevenin and Norton's theorems is to make a complex circuit reduce to a simple one.





Thevenin's theorem states that an entire network can be replaced by an equivalent circuit containing only two components which are an independent voltage source in series with a resistor.

Norton's theorem is similar to Thevenin's theorem except the equivalent circuit contains an independent current source in parallel with a resistor.

Summary

- Lab 1 Report & Pre-lab 2 are due on Tuesday 26th January 2021 by midnight.

- Analyze circuit in Fig. 1.3 under 3 assumptions – all resistors are exact value, 10% above the exact values, and 10% below the exact values.
  - Hands calculations
  - Simulations
  - ~~Experimental results~~
- Analyze circuit in Fig. 1.4 – Fig. 1.7
  - Simulations
  - ~~Experimental results~~