Homework 4: Superposition and Source Transformation

Introduction

The problems for this week focus on applications of linearity - particularly superposition, source transformations, and equivalent circuits. In problems involving circuits, be sure to draw and label the circuit and demonstrate the particular solution method noted. Merely finding the right answer - especially when the right answer is given - will earn no credit.

Problems

Connect

(1) **A&S 4.3**. The goal here is to solve symbolically and then see how changes in either the source value or the resistor values will change the measurements.

(2) **A&S 4.13**. Be sure to re-draw the circuit three times. You should use some combination of division (voltage and/or current) and/or Ohm's Law each time.

(3) **A&S 4.16**. Be sure to re-draw the circuit three times. You should use some combination of division (voltage and/or current) and/or Ohm's Law each time.

(4) **A&S 4.41**. This circuit has at least one independent source and no dependent sources.

(5) **A&S 4.55**. This circuit has at least one independent source and one dependent source.

(6) **A&S 4.62**. This circuit has no independent sources and at least one dependent source. Example 4.10 on pp. 141-143 shows how to use a test current (in this case a 1 A source) to excite the circuit and determine the equivalent resistance. Note that the equivalent source will be either 0 V or 0 A since there is no independent source in the circuit.

(7) **A&S 4.72**.

(8) **A&S 4.73**.

(9) **A&S 4.86**.

Sakai

Be sure to read Section 4.10.2 in the book about taking resistance measurements using a Wheatstone bridge.

(1) **A&S 4.91**. There is a typo in the problem - it should be asking for the values of R_1 and R_3, not R_a and R_b. Instead of finding actual resistor values, find the relationship that needs to exist between R_1 and R_3 for the two different measurement ranges.

(2) Based on **A&S 4.92**. Find the Thévenin equivalent circuit as seen between terminals a and b when the bottom right resistor is an 18 kΩ resistor, then use that to determine the resistance needed for maximum power transfer and what that power is. Include a drawing of the Thévenin equivalent circuit with the elements labeled.