Homework 3: NVM, BCM, MCM

Introduction

The problems for this week focus on circuit elements and circuit solution methods - primarily the Node Voltage Method, Branch Current Method, and Mesh Current Method. In problems involving circuits, be sure to draw and label the circuit and demonstrate the particular solution method noted. You will want to look in the Resources folder on Sakai for a folder called `Examples` and, within that, a folder called `Methods`. Within *that*, there are PDFs showing how to label three different circuits (Examples 3.4, 3.7, 3.11) with each of three different methods. There are also Maple worksheets in MW and PDF formats showing how to set up and solve Example 3.11 using Maple for the three different methods. The Maple examples all start with the characters `AS6` while the labeled schematics all start with `Ex03p` followed by the problem number. These examples from the sixth edition of the book match those from the seventh.

Problems

Connect

For these problems, if you need to solve simultaneous equations you may use Maple, Mathematica, Python, or MATLAB to do so. You will **not** need to document the computational work for the Connect problems.

(1) **A&S 3.4**. Be sure to use the Node Voltage Method; note in this case that there are two equations but that they are not coupled.

(2) **A&S 3.12**. Be sure to use the Node Voltage Method.

(3) **A&S 3.15**. Be sure to use the Node Voltage Method.

(4) **A&S 3.36**. Be sure to use the Mesh Current Method.

(5) **A&S 3.52**. Be sure to use the Mesh Current Method. Optional extension: go back and label the circuit using Super Smart Branch Current method - you will notice that you only have two equations and two unknowns instead of four equations and four unknowns!

(6) **A&S 3.60**. Be sure to use the Mesh Current Method.

(7) **A&S 3.69**. See Section 3.6 in the book.

(8) **A&S 3.71**. See Section 3.6 in the book.

Sakai

For these problems, you will be labeling a circuit using a particular method and then finding and solving the equations for that method. You will need to turn in an image as well as your Maple worksheet for each problem. There is a template you can use for the circuit drawings in the Resources section on Sakai under `Homework Resources / HW 03`.

Note that you have actually solved this circuit using the brute force method so you can check your work. The key thing is you *must* clearly show the correct method. You can use any combination of lazy, smart, and really smart labels for NVM and MCM and smart and really smart labels for BCM. Your worksheet should show symbolic sets of equations, numerical solutions with four significant figures for your unknown voltages and currents, and numerical solutions with four significant figures for the powers.

(1) Based on **A&S 3.31**. Clearly label the circuit using the Node Voltage Method and come up with the necessary set of equations to solve for the unknowns. Use Maple to solve for these unknowns and also calculate the power delivered by each source. Have the base file names of your image and Maple files for this problem end with `NVM`.

(2) Based on **A&S 3.31**. Clearly label the circuit using the Mesh Current Method and come up with the necessary set of equations to solve for the unknowns. Use Maple to solve for these unknowns and also calculate the power delivered by each source. Have the base file names of your image and Maple files for this problem end with `MCM`.

(3) Based on **A&S 3.31**. Clearly label the circuit using the Branch Current Method and come up with the necessary set of equations to solve for the unknowns. Use Maple to solve for these unknowns and also calculate the power delivered by each source. Have the base file names of your image and Maple files for this problem end with `BCM`.