ECE210 / ECE211 - Homework 02

Due: Wednesday, September 12 @ 6pm.

Homework Policy:

- Homework assignments in ECE 210 constitute an essential component of your learning experience in the course and prepare you for your mid-term 'hour exams' and the end-of-semester 'final exam' in most effective ways – investing time to do your homework with care will pay off when you are taking your exams.
  You will be expected to provide detailed explanations of your solutions in order to obtain full credit in your homework assignments. Conversely, solutions lacking full explanations will receive **zero credit** even when the answer provided may be correct and furthermore incorrect answers without any work shown may lead to '**academic integrity violation**' cases being opened against you. Some of the homework problems you will be assigned will resemble problems from previous semesters but with modified parameters and/or inputs. Your comprehensive homework solutions will naturally be expected to match the versions of the problems assigned during the current semester, whereas solutions or answers matching the versions from previous semesters will once again lead to '**academic integrity violation**' cases being brought against you.
  Please keep these cautionary remarks in mind as you are working out your homework assignments and avoid submitting unsubstantiated solutions to **avoid** any misinterpretations as explained above.
- Written assignments are due every Wednesday at 6 p.m. in the homework boxes located on the northwest corner of the 3rd floor of ECEB, next to the service elevator. Late homework (even by a minute) will receive **no credit**. Each section has its own box.
- When you submit your homework, be sure that your name, section, and NetID are printed neatly at the top of the page. This will ensure that your score is recorded correctly. Note that your NetID is not your UIN. If you fail to write your section, you will **lose** 10% of the total allocated score for that assignment. Homeworks with missing or illegible name and netID will be deducted 50% of the allocated score.
- All homework must be stapled. If you fail to staple your homework, you will **lose** 10% of the total allocated score. If you fail to staple and your pages become lost only the pages with your name on them will be graded. There is a stapler in undergrad lounge and the advising office.
- Make sure that your HW is neat enough to read. Graders has the flexibility to **deduct** up to 20% for lack of neatness. Doing things like boxing your answers, showing ALL of your work, and generally making it easier for the graders to grade will overall increase your scores on HW.

Problems:

1. Consider the following circuit

   (a) Use the node-voltage method to obtain a set of equations, in terms of the node voltages **only**, that can be solved to obtain all node voltages using the bottom node as the reference node.

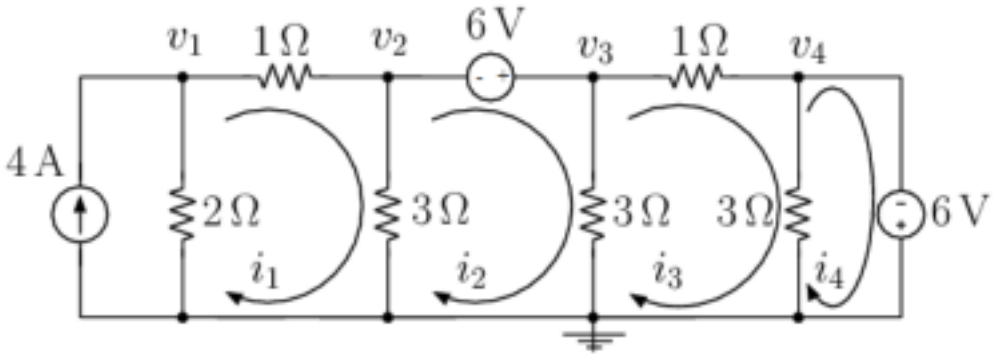
   (b) Use the loop-current method to obtain a set of equations, in terms of loop currents **only**, that can be solved to obtain all loop currents.

   (c) Obtain all node voltages. You can use software (Matlab, Mathematica, etc.) to solve the equations, but include your code.

   (d) Obtain all loop currents. You can use software (Matlab, Mathematica, etc.) to solve the equations, but include your code.

   (e) Use superposition to obtain the voltage across the terminals of the 2Ω resistor.

(f) Obtain the power absorbed by the 2Ω resistor



2. Consider the following circuit.

(a) Use the node-voltage method to obtain a set of equations, in terms of the node voltages **only**, that can be solved to obtain all node voltages using the bottom node as the reference node.

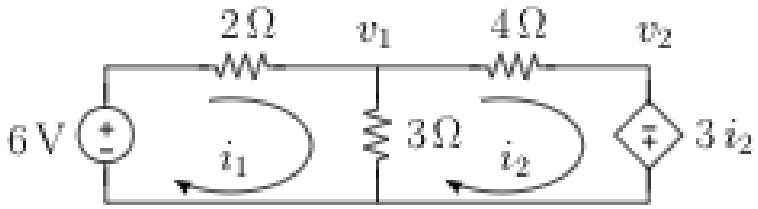
(b) Use the loop-current method to obtain a set of equations, in terms of loop currents **only**, that can be solved to obtain all loop currents.

(c) Obtain all node voltages. You can use software (Matlab, Mathematica, etc.) to solve the equations, but include your code.

(d) Obtain all loop currents. You can use software (Matlab, Mathematica, etc.) to solve the equations, but include your code.

(e) Use superposition to obtain the current through the dependent voltage source.

(f) Obtain the power absorbed by the dependent voltage source.



3. Consider the following circuit

(a) Use the node-voltage method to obtain a set of equations, in terms of the node voltages **only**, that can be solved to obtain all node voltages using the bottom node as the reference node.

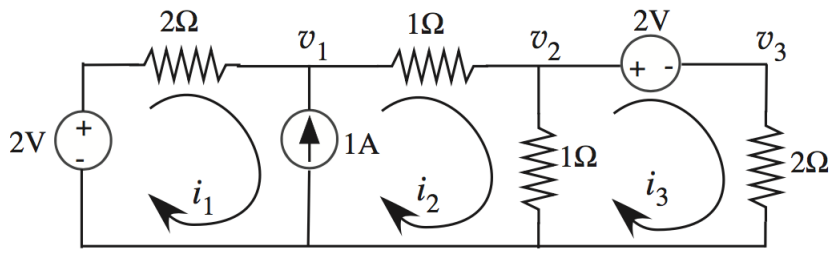
(b) Use the loop-current method to obtain a set of equations, in terms of loop currents **only**, that can be solved to obtain all loop currents.

(c) Obtain all node voltages. You can use software (Matlab, Mathematica, etc.) to solve the equations, but include your code.

(d) Obtain all loop currents. You can use software (Matlab, Mathematica, etc.) to solve the equations, but include your code.

(e) Use superposition to obtain the voltage across the terminals of the current source.

(f) Obtain the power absorbed by the current source

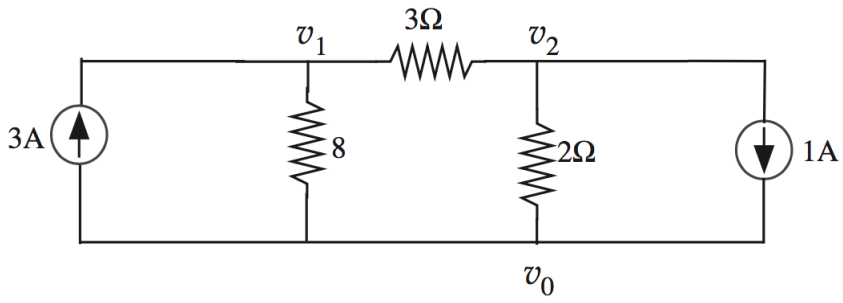


4. Consider the circuit below

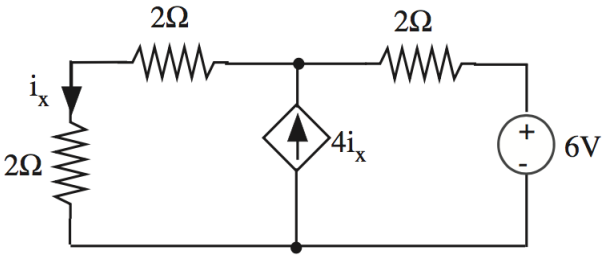
   (a) Write nodal equations for the circuit below, assuming that v_0 = ground. Solve for v_1 and v_2. You can use software (Matlab, Mathematica, etc.) to solve the equations, but include your code.

   (b) Write nodal equations for the same circuit, but this time, assume that v_1 = ground. Solve for v_0 and v_2. You can use software (Matlab, Mathematica, etc.) to solve the equations, but include your code.

   (c) How are your answers to parts (a) and (b) related?



5. Find i_x using nodal analysis. You **cannot** use software (Matlab, Mathematica, etc.) to solve this problem, you have to solve it by hand.



6. Let $Z = \frac{j\left(e^{j\frac{\pi}{6}} - e^{-j\frac{\pi}{6}}\right)}{e^{-j\frac{\pi}{3}} + e^{j\frac{\pi}{3}}}$. Write Z in rectangular and polar forms.