Name: SOLUTION (please print)

Signature: ______________________

Section (underline one): Trombetta Shattuck

ECE 2300 – Quiz #2
February 13, 2012

Keep this quiz closed and face up until you are told to begin.

1. This quiz is closed book, closed notes. You may use one 8.5" x 11" crib sheet, or its equivalent.
2. Show all work on these pages. Show all work necessary to complete the problem. A solution without the appropriate work shown will receive no credit. A solution which is not given in a reasonable order will lose credit.
3. It is assumed that your work will begin on the same page as the problem statement. If you choose to begin your work on another page, you must indicate this on the page with the problem statement, with a clear indication of where the work can be found. **If your work continues on to another page, indicate clearly where your work can be found. Failure to indicate this clearly will result in a loss of credit.**
4. Show all units in solutions, intermediate results, and figures. Units in the quiz will be included between square brackets.
5. Do not use red ink. Do not use red pencil.
6. You will have 30 minutes to work on this quiz.

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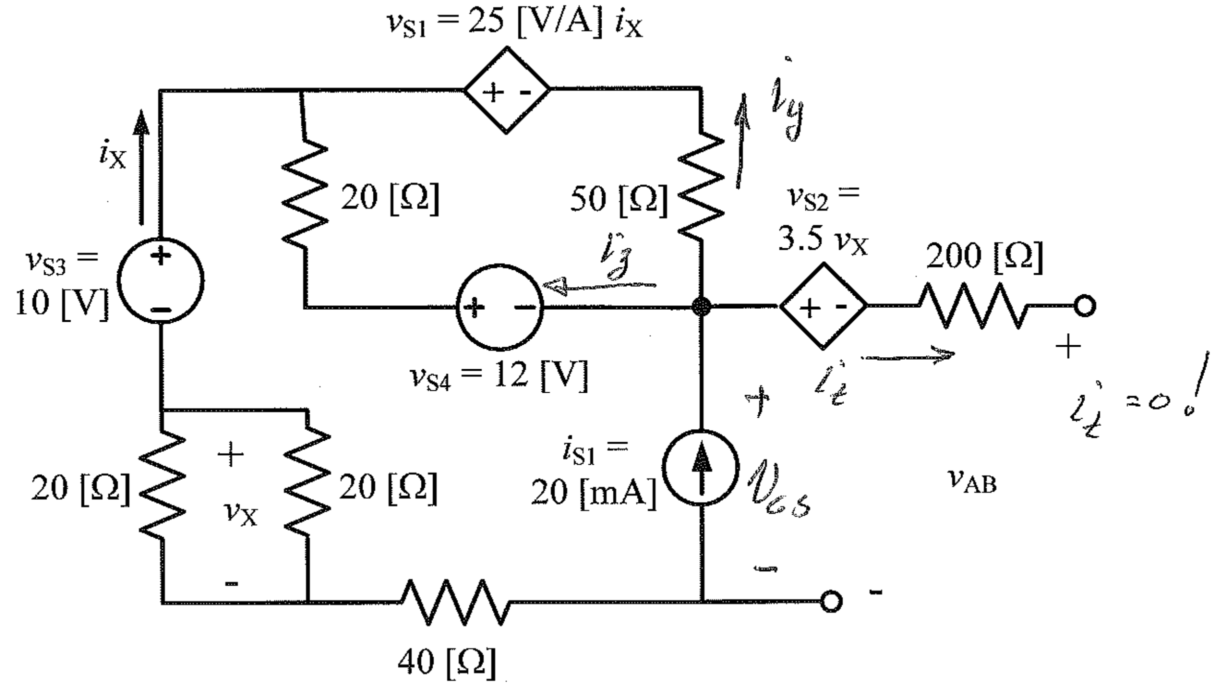
For the circuit below, do the following.

a) Find the power delivered to the circuit by the voltage source v_{S1}.
b) Find the power delivered to the circuit by the independent current source.
c) Find the voltage v_{AB}.



One possible approach here is to note that we can find anything we need if we know the three currents i_x, i_y, and i_z. (There are two additional, equal currents flowing in the two 20 [Ω] resistors, but if we put them in parallel, the voltage across the resulting 10 [Ω] will be v_X, and the current through 10 [Ω] will be i_x.)

Now $i_x = -0.02$ [A] and we need two equations for i_y and i_z (defined in the figure):

KCL $\quad i_y + i_z = 0.02$

KVL $\quad 50\, i_y - 25\, i_x - 20\, i_z + 12 = 0$

(next page)

Room for extra work

Other KVL's are of course possible, but any other one requires use of voltages that are presently unknown, like the voltage across the current source V_{cs}.

Since i_x is known we can solve for the others:

$i_y = -0.17285$ [A] $i_z = 0.19285$ [A]

Now we're ready.-

a) $P_{del, vs1} = 25\left[\frac{V}{A}\right] \cdot i_x \cdot i_y$

$= 25(-0.02)\cdot(-0.17285) = +86.42$ [mW]

b) $P_{del, i_{s1}} = i_{s1} \cdot V_{cs}$

KVL: $-V_{cs} - 12 + 20 i_z + 10 + V_x + 40(0.02) = 0$

$V_x = -i_x \cdot 10 = -(-0.02)(10) = 0.2$ [V]

(10: $20[\Omega] \,//\, 20[\Omega]$)

$\Rightarrow V_{cs} = 2.857$ [V]

$\Rightarrow P_{del, i_{s1}} = 0.02\cdot(2.857) = 57.14$ [mW]

c) KVL: $V_{AB} = -3.5 V_x + V_{cs} = 2.157$ [V]