ECE 2210/00 Exam 1 given: Fall 05

(The space between problems has been removed.)

To get the most possible partial credit, always show all the intermediate values that you can calculate. If further calculations depend on a value that you can't figure out, just use a letter (like I_{R1}) or a guessed value and proceed.

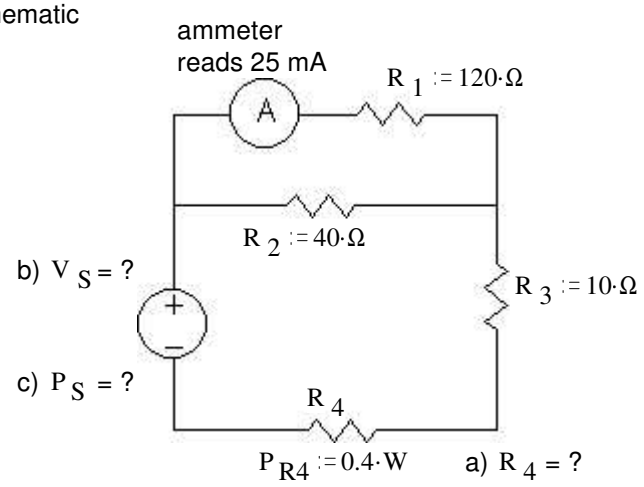
Note: feel free to show answers & work right on the schematic

1. (18 pts) The ammeter, A, reads 25 mA.

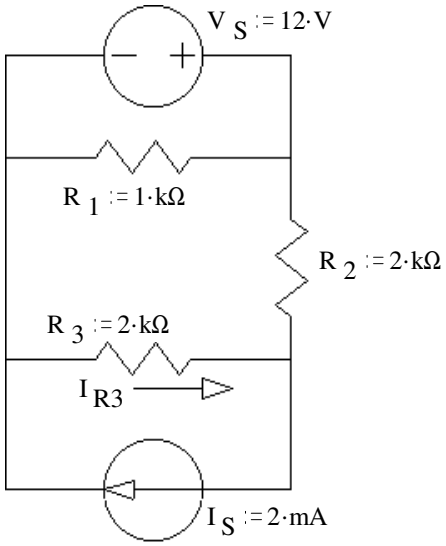
   a) The power dissipated by R_4 is 0.4 W, what is the value of R_4. Assume that the ammeter is ideal (has no resistance).

   b) What is the value of V_S?

   c) How much power is provided by the source?



2. (18 pts) a) Use the method of superposition to find the current through R_3. Be sure to clearly show and **circle** your intermediate results.



3. (18 pts) An ideal voltmeter is hooked to the terminals of a temperature sensor and measures 120 mV when the sensor is at 60º F. A 10 kΩ load resistor is hooked to the sensor and the voltmeter now reads 80 mV.

   a) Draw a simple, reasonable model (think Thevenin) of the 60º F temperature sensor. Find the value of each part of the model. (Recall what you did in the lab with the "Input Position" potentiometer.)

   The temperature sensor remains 60ºF for the rest of this problem.

   b) The ideal voltmeter and the 10 kΩ resistor are removed and replaced by a non-ideal voltmeter that has an internal resistance of 20 kΩ (that means it looks like a 20 kΩ load resistor). What does this voltmeter show? (Give me a voltage value.)

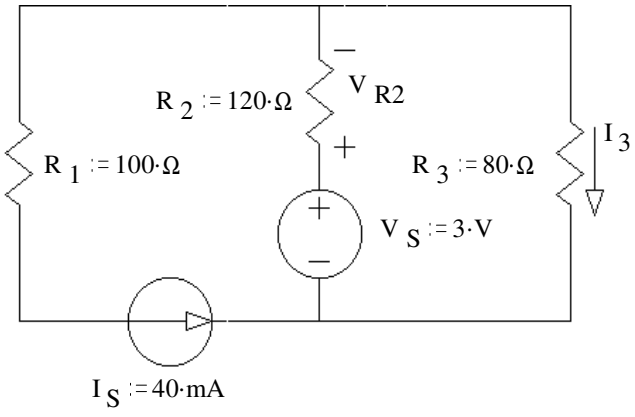
   c) The voltmeter is removed and the sensor is hooked to a circuit which makes 10 µA flow back into the temperature sensor. (The current is flowing in the opposite direction as in parts a and b, above). What voltage would you expect accoss the terminals of the sensor now?

4. (23 pts)
   a) Use nodal analysis to find the voltage across R_2 (V_{R2}).

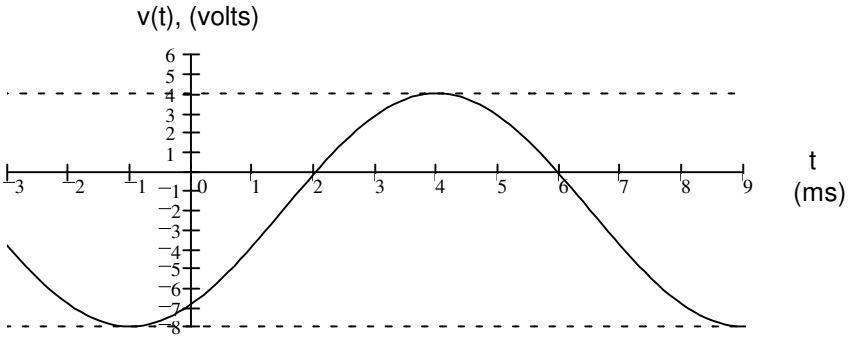
   You **MUST** show all the steps of nodal analysis work to get credit, including drawing appropriate symbols and labels on the circuit shown.

   Remember, you want to find V_{R2}.

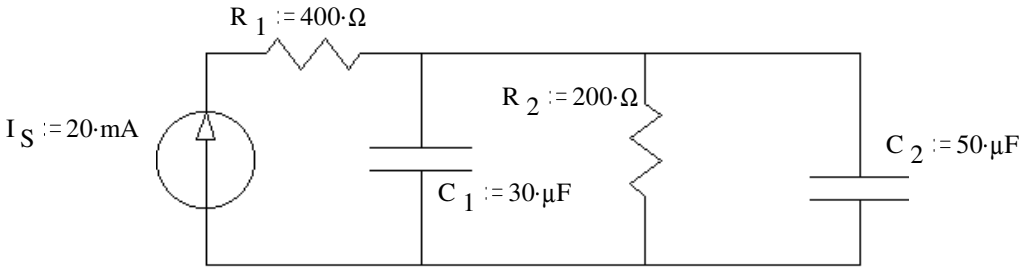
   b) Find the current through R_3 (I_3).



5. (13 pts) For the waveform shown, find a complete expression for v(t) as a cosine wave. Include numbers and units.



6. (10 pts) The circuit below has been connected as shown for a long time



   a) Find the voltage across each capacitor. V_{C1} = ? V_{C2} = ?

   b) How much energy is stored in capacitor C_2.

Answers

1.a) $40\cdot\Omega$ b) $8\cdot V$ c) $0.8\cdot W$

2. $1\cdot mA - 3\cdot mA = -2\ \bullet mA$

3.a) $120\cdot mV$ $5\cdot k\Omega$ b) $96\cdot mV$ c) $170\cdot mV$

4.a) $3.72\cdot V$ b) $-9\cdot mA$

5. $6\cdot V\cdot\cos\left(628.3\cdot\frac{rad}{sec}\cdot t - 144\cdot deg\right) - 2\cdot V$

6.a) $4\cdot V$, $4\cdot V$ b) $0.4\cdot mJ$

ECE 2210 / 00 Midterm #1 Arn Stolp

Name _____

Scores:

Pages 1&2 _____ of a possible 36 pts

Pages 3&4 _____ of a possible 41 pts

Pages 5&6 _____ of a possible 23 pts

Total _____ of a possible 100 pts