EE42/100 Spring 2006 Problem Set 1

Issued: Jan 19, 2006 Due: Jan 27, 2006

Please remember that homeworks are due at 12:00 noon Friday January 26.
Please put your homework in the appropriate box (EE42 or EE100) in 240 Cory Hall.
Print your name(s) in upper right corner of your paper and indicate whether you're enrolled in EE42 or EE100.

1. *(Reading Assignment)* Chapter 1: Hambley 3rd edition.

2. *(Charge, current flow)* A1.5-volt AA battery is connected across a 1 kΩ resistor, with the positive terminal of the battery connected to the top end of the resistor. Electrons flow in the connecting wires and the resistor.
   a. Draw a schematic of the circuit. Which direction do the electrons move in the resistor (top to bottom or bottom to top)?
   b. What is the direction of the current flow? (In this course, when we speak of current we mean the equivalent flow of positive charges.)
   c. What is the value of that current in amperes?
   d. How many electrons flow through the resistor in one second?

3. *(Kirchhoff's Current Law*) Use KCL to determine the unknown currents in the circuit shown. Assume that $I_0 = -2A$, $I_S = 8A$, and $V_S = 12$ V. Note that R_1 represents an open circuit.

4. *(Kirchhoff's Current Law)* $I_1 = 5$ mA and $I_2 = -3$ mA. Find the current I_3 in the circuit shown.

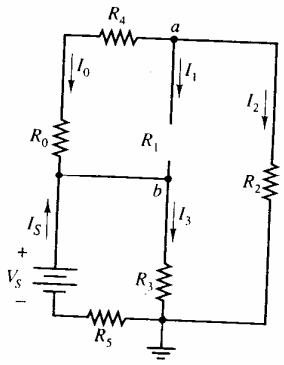
5. *(Reference directions)* The directions of the currents and the polarities of the voltage sources have been defined. Find the values of the indicated currents and voltages.

6. *(Resistive voltage-divider circuits)* The circuits below are known as *voltage dividers* since for each circuit the voltage V_{OUT} is just a fraction (less than one) of the voltage of the source at the left. For each circuit, determine the resistor values necessary to achieve the indicated voltages. Also determine the power ratings of each resistor assuming that resistors are available in 1/8-, ¼-, ½-, and 1-W ratings.

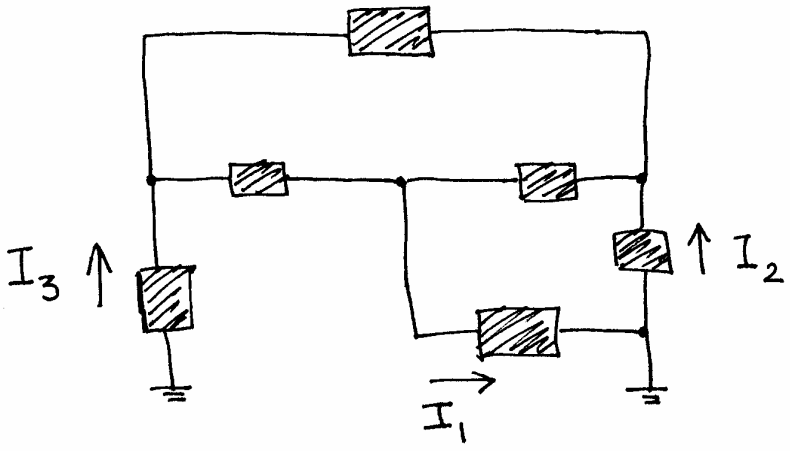
7. *(Circuit Analysis)* For the circuit shown find
   a. The currents i_1 and i_2.
   b. The power delivered by the 3-A current source and by the 12-V voltage source.
   c. The total power dissipated by the circuit.

   Assume that $R_1 = 25\Omega$, $R_2 = 10\ \Omega$, $R_3 = 5\ \Omega$, $R_4 = 7\ \Omega$, and express i_1 and i_2 as functions of v. (Hint: Apply KCL at the node v between R_1 and R_3.)

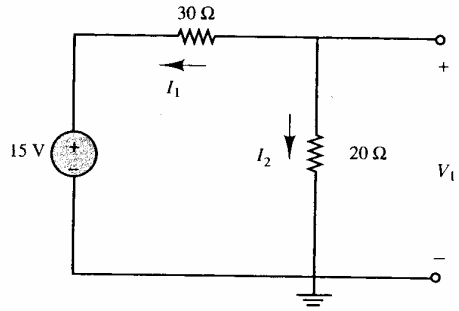
Problem 3



Problem 4



Problem 5



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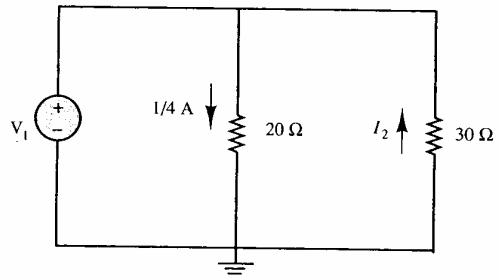
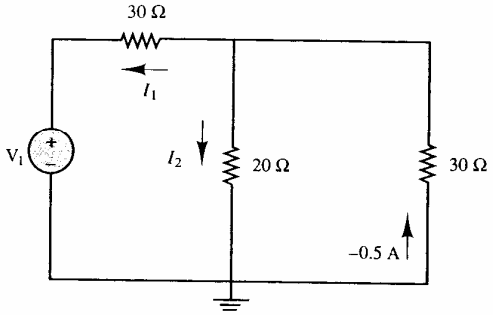
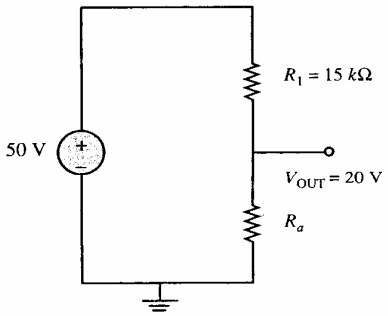


(b)

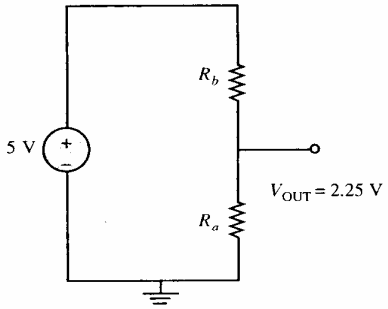


(c)

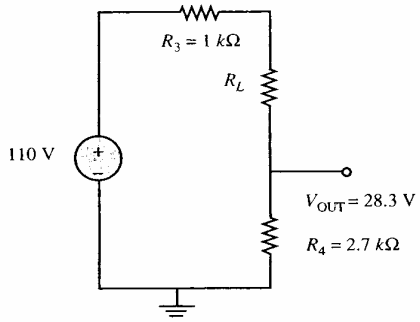
Problem 6



(a)



(b)



(c)

Problem 7