

**EEE 33 1<sup>st</sup> Semester SY 2008-2009**

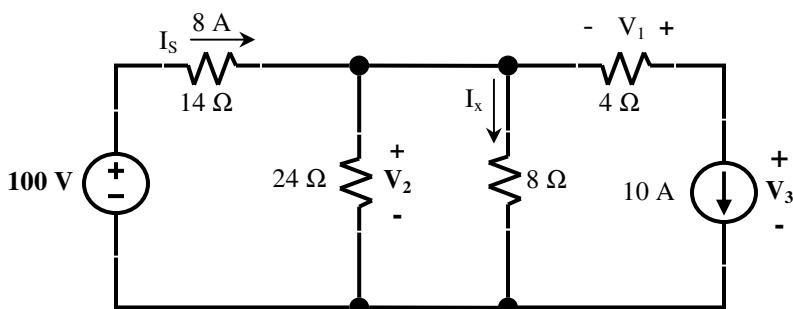
**Problem Set #1**

Due: July 11, 2008 (WFR 8:30am, WFU 10:00am @ EEE33 Dropbox)

**Instructions:**

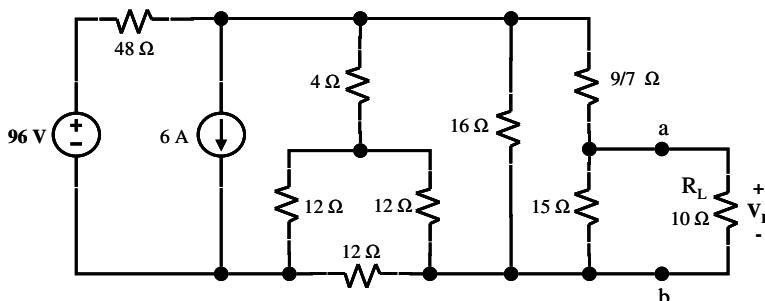
1. Use only *lined* paper. Write your name, student number, and DC section and instructor on each page. On the first page clearly write, in big bold letters, your complete DC section (e.g. WFUM) at the upper right hand corner.
2. Use only black or blue ballpoint pens. Do not write anything at the reverse side of your paper. Encircle all final answers.
3. Write your solutions completely, clearly and legibly in an orderly and logical fashion and with minimal erasures. The checker reserves the right to disregard solutions that are illegible or difficult to follow, or if there are too many erasures.
4. You are expected to work on this independently. Acts of dishonesty will be dealt with accordingly.
5. You may start submitting your problem set on July 9, 1:00 pm at the EEE33 Drop box near the guard. No problem set will be accepted after the deadline.

**Problem #1**



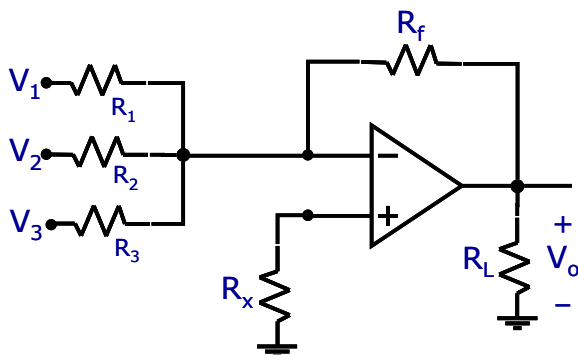
- a. Find  $V_1$ ,  $V_2$ ,  $I_x$  and the power delivered by the 10 A source.
- b. If the current source is replaced by a 2Ω resistor, find the new  $V_3$ .
- c. If the voltage source is replaced by a 6Ω resistor, find the new  $I_s$ .

**Problem #2**



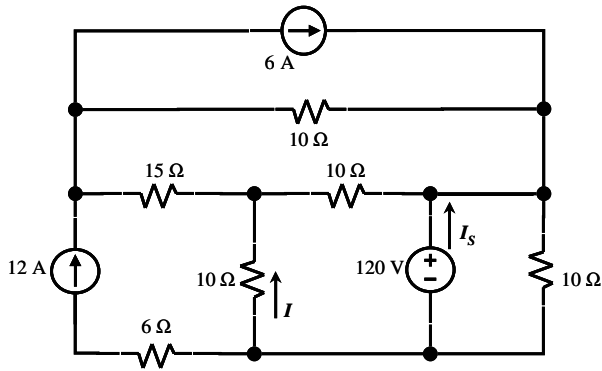
Use network reduction techniques to reduce the network to the left of nodes  $a$  and  $b$  into just a single source and a single resistor. Then solve for  $V_L$  and the power delivered to the load resistor  $R_L$ .

**Problem #3**



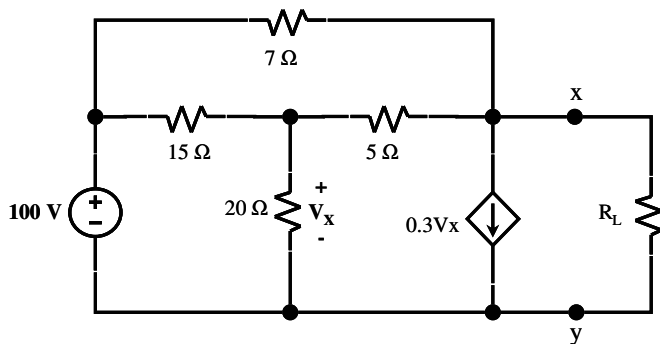
Find  $V_o$  of the op-amp circuit if  $R_1 = R_2 = R_3 = 3R_f$ . What mathematical operation does the circuit do for inputs  $V_1$ ,  $V_2$ , and  $V_3$ ?

**Problem #4**



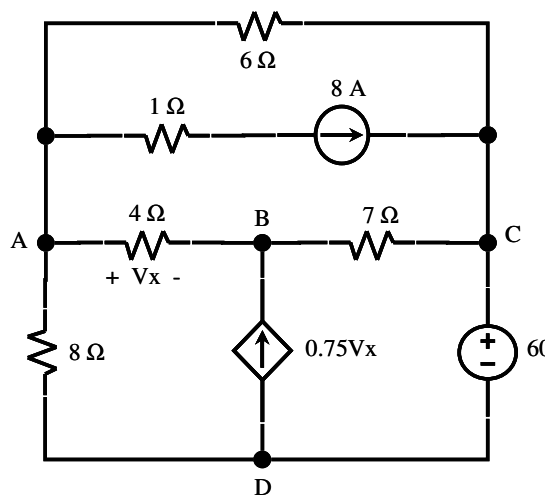
- Use superposition to solve for the current  $I$ .
- Using your answer above, solve for the current  $I_s$  and the power delivered by the voltage source.

**Problem #5**



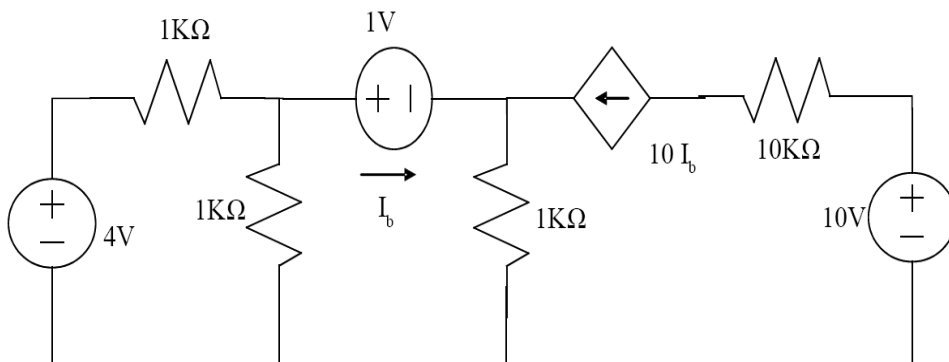
- Solve for the Thevenin equivalent circuit seen by  $R_L$ .
- Derive the Norton equivalent circuit from your answer in item **a** above.
- What should  $R_L$  be so that maximum power is delivered to it? What is the value of this maximum power?
- If  $R_L$  is at a value equal to your answer in item **c**, find the current through the  $7\Omega$  resistor. *Hint: Start with your Thevenin equivalent circuit.*

**Problem #6**



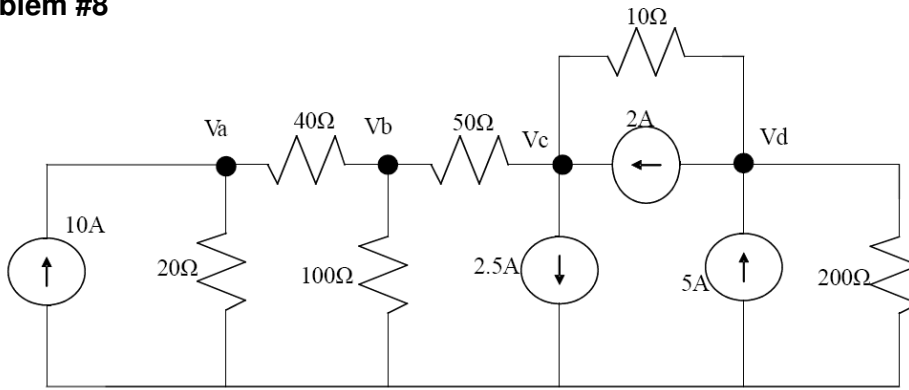
- Set up the node equations and solve for the node voltages  $V_A$ ,  $V_B$ , and  $V_C$ . Use node D as reference node.
- What is  $V_x$  and the power delivered by the voltage source?
- Confirm your answers in item **b** using mesh analysis.

**Problem#7**



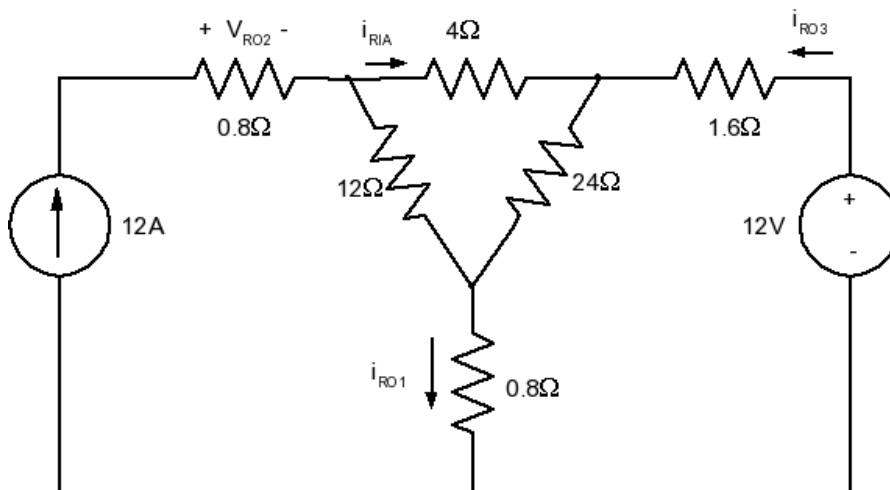
Use superposition to find  $I_b$ , the power dissipated by the  $10K\Omega$  resistor, and the power delivered by the  $1V$  source.

**Problem #8**



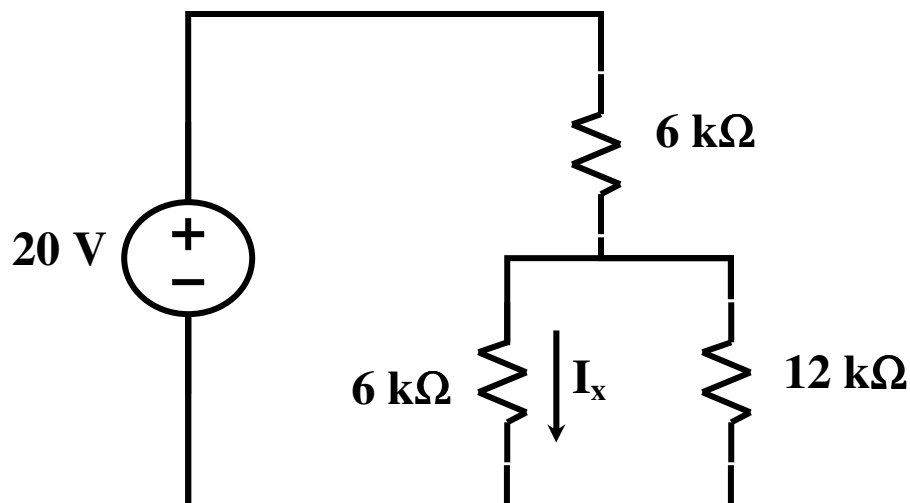
- Use nodal analysis to find the node voltages  $V_a$ ,  $V_b$ ,  $V_c$  and  $V_d$ .
- Use mesh analysis to find the current through the 100Ω resistor.
- Find the Thevenin and Norton equivalent circuits seen by the 100Ω resistor.

**Problem #9**



Find  $i_{RO1}$ ,  $i_{RO3}$ , and  $i_{RIA}$  using resistive simplification, Ohm's law, KCL and KVL only.

**Problem #10**



Solve for  $I_x$  in the simple circuit above in at least four different ways.