SCHULICH
School of Engineering

UNIVERSITY OF
CALGARY

ENGG 325 - Electric Circuits and Systems

Midterm Examination

Wednesday, November 1, 2006
Time: 6:30 - 8:00 PM

Instructions:

- Time allowed is 90 minutes.

- The examination is closed-book.

- Any type of portable calculator is permitted.

- The maximum number of marks is 50, as indicated; the midterm examination counts 25% toward the final grade.

- Please use a pen or heavy pencil to ensure legibility.

- Please answer questions in the spaces provided; if space is insufficient, please use the back of the pages.

- Please show your work; where appropriate, marks will be awarded for proper and well-reasoned explanations.

Name: —————————————————— , *ID:* ————————————

1. Consider the circuit in Fig. Q1.

   (a) Use your choice of circuit analysis methods to find i_x and i_y.   **[5 marks.]**

   (b) Repeat part (a) using your choice of *any other* circuit analysis method.

   [5 marks.]

   (c) Determine the total resistance "seen" by (i.e., across the terminals of) the current source. *(Hint: there are many simple ways to do this.)*
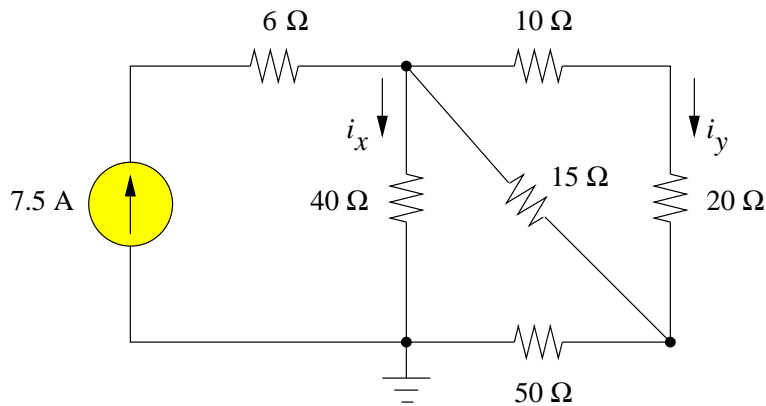
   [2 marks.]

Fig. Q1. Find i_x, i_y two different ways; find resistance across current source.

[12 marks total.]

(Question 1, additional workspace ...)
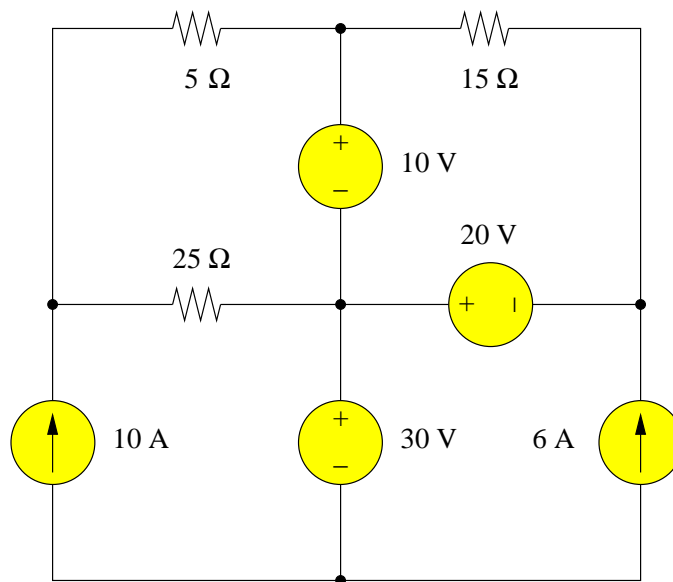
2. Consider the circuit given in Fig. Q2, and use your choice of methods to determine the following.

   (a) Find all of the node voltages.   **[6 marks.]**

   (b) Find the power in each of the following sources, and specify whether the power is absorbed or supplied:

      i. 10 A current source;
      ii. 30 V voltage source;
      iii. 10 V voltage source.

                                                                         [2 marks each.]

Fig. Q2. Find all of the node voltages and power in three of the sources.

                                                                         [12 marks total.]

(Question 2, additional workspace ...)

3. Consider the circuit shown in Fig. Q3.

   (a) Calculate the Thévenin equivalent circuit at the terminals **a** and **b**, assuming the
       load resistor R_L is not connected. **[10 marks.]**

   (b) Now connect R_L to the circuit and predict v_L for the following values of R_L:

       i. $R_L = 1.25\Omega$;
       ii. $R_L = 7.5\Omega$;
       iii. $R_L = 20\Omega$.
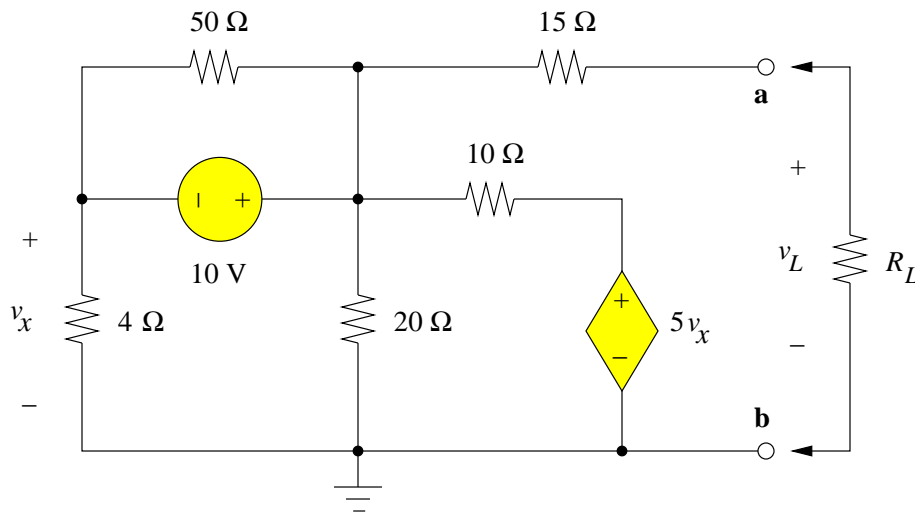
[1 mark each.]

Fig. Q3. Determine the Thévenin equivalent circuit; find v_L for three cases.

[13 marks total.]

(Question 3, additional workspace ...)

4. Consider the circuit given in Fig. Q4.

   (a) Determine i_x using superposition.   **[10 marks.]**

   (b) Find the power in the 5Ω resistor and 100 V voltage source; specify for each if
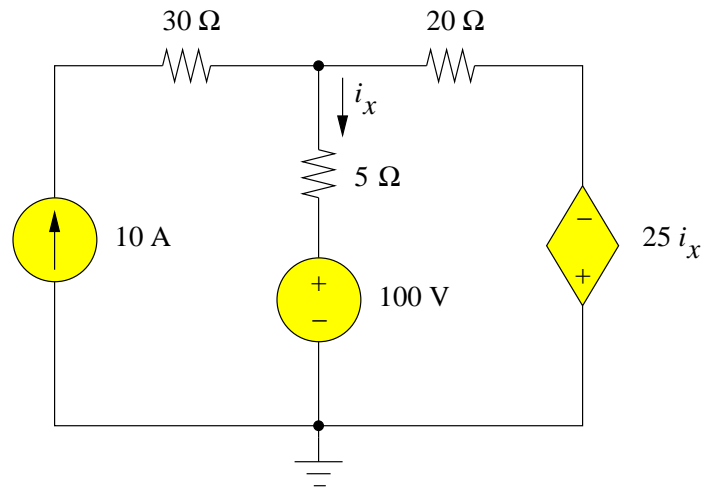   this is absorbed or supplied.   **[3 marks.]**

Fig. Q4. Find i_x by superposition; find power in 5Ω resistor and 100 V source.

[13 marks total.]

(Question 4, additional workspace ...)