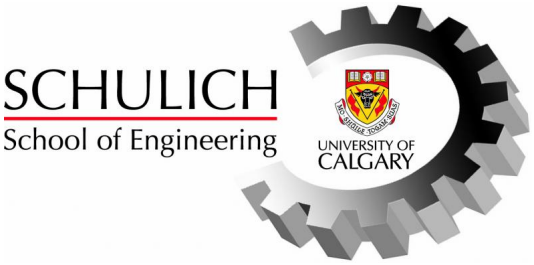
Name: _____ *Lecture Section:* _____

L01 - *Chris Macnab*
L02 - *Norm Bartley*
L03 - *Norm Bartley*
L04 - *Anis Haque*



ENGG 225 - Fundamentals of Electrical Circuits and Machines

Midterm Examination

Tuesday, February 23, 2016
Time: 7:00 - 8:30 PM

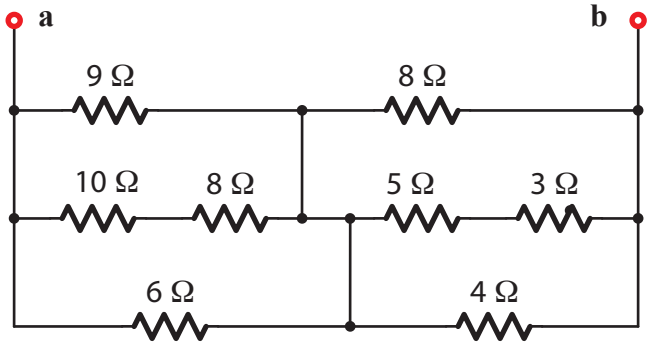
Instructions:

- Time allowed is 90 minutes.
- The examination is closed-book.
- Only calculators sanctioned by the Schulich School of Engineering are permitted in the examination.
- The maximum number of marks is 45, as indicated; please attempt all questions. 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.

UCID: _____

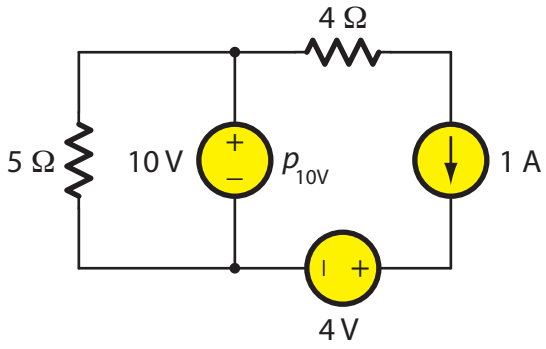
1. **[15 marks.]** Parts (a)-(e) below each have an identical weighting of three marks. Please answer the questions in the boxes provided.

(a) **[3]** In the circuit at right, determine the equivalent resistance R_{eq} as seen at the terminals **a** and **b**.



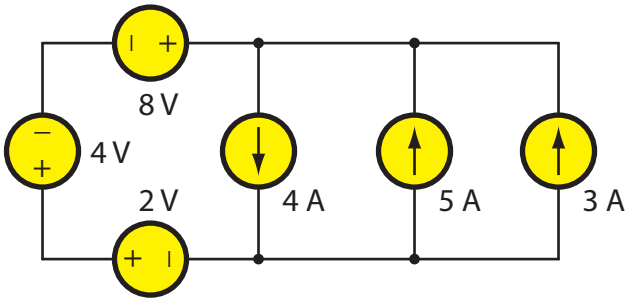
Answer: $R_{eq} =$

(b) **[3]** In the circuit at right, determine the power p_{10V} in the 10-Volt souce.

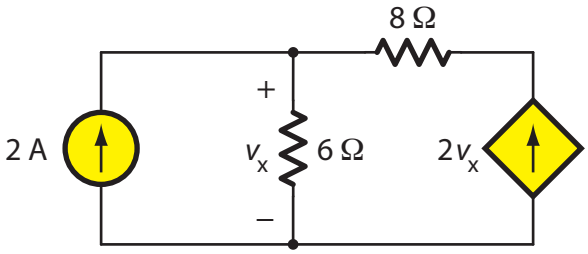


Answer: $p_{10V} =$

(c) **[3]** Simplify the circuit at right so that there is only one voltage source and one current source.

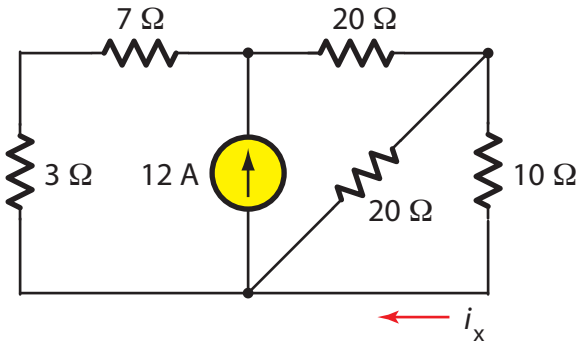


(d) **[3]** In the circuit at right, find v_x.



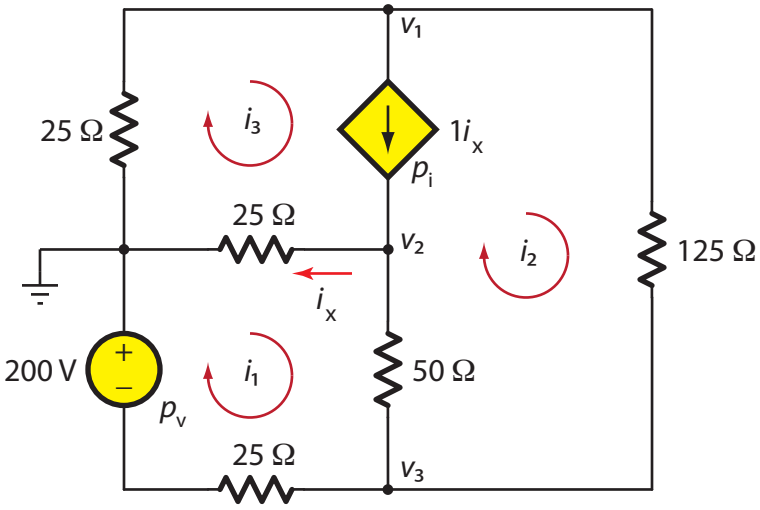
Answer: $v_x =$

(e) **[3]** In the circuit at right, find i_x.



Answer: $i_x =$

2. [**18 marks.**] Consider the circuit below.



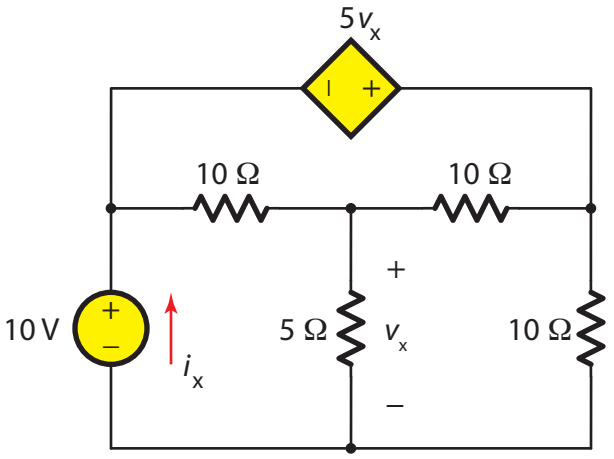
(a) [**9**] Determine the mesh currents i_1, i_2, and i_3.

(b) [**4**] Using your answers from part (a), determine the power in both sources, p_v and p_i, as indicated.

(c) [**5**] Write *(but do not solve)* the node-voltage equations. Express the equations using only the node voltages v_1, v_2, and v_3 as variables. It is not necessary to simplify your equations.

(Question 2, additional workspace ...)

3. **[12 marks.]** Consider the circuit below, which you may analyze using any method of your choosing.



(a) **[8]** Determine the voltage v_x.

(b) **[4]** Determine the current i_x.

(Question 3, additional workspace ...)

(Please do not write in this space.)

#1 *(15)*	**#2** *(18)*	**#3** *(12)*	**Total** *(45)*