

Name: \_\_\_\_\_

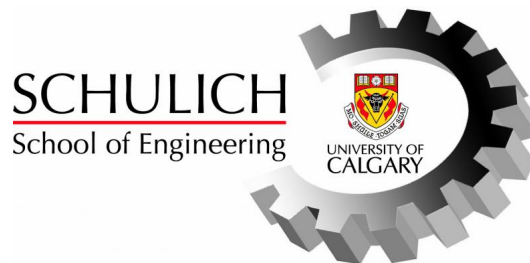
Lecture Section: \_\_\_\_\_

**L01** - *Anis Haque*

**L02** - *Norm Bartley*

**L03** - *Michel Fattouche*

**L04** - *Anders Nygren*



ENGG 225 - Fundamentals of Electrical Circuits and Machines

## Midterm Examination

Thursday, February 28, 2013

Time: 7:00 - 8:30 PM

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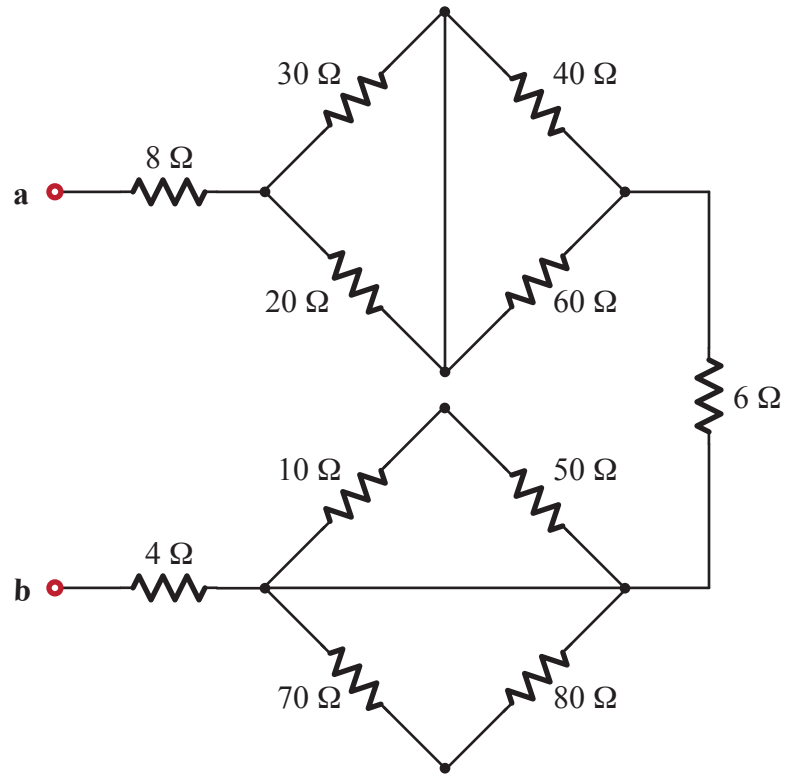
### Instructions:

- 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 40, 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.
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UCID: \_\_\_\_\_

1. [15 marks.] Parts (a)-(e) below each have an identical weighting of three marks. Please answer the questions in the boxes provided. For Question 1 only, part marks for incorrect answers will not be awarded.

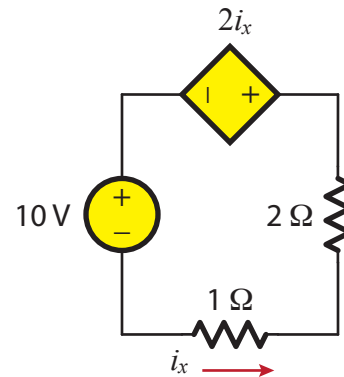
- (a) [3] In the resistor circuit below, determine the total resistance  $R_{ab}$  between the terminals **a** and **b**.



Answer:  $R_{ab} =$

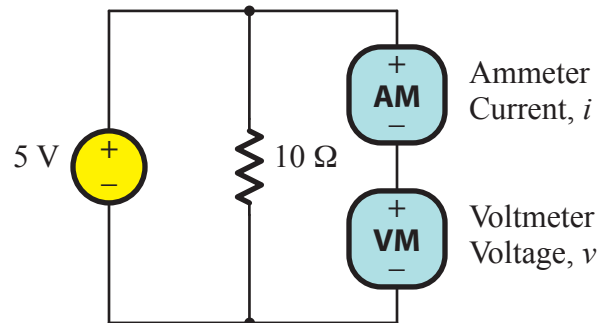
(Question 1, continued ...)

- (b) [3] For the circuit given at right, calculate the power  $p_{2i_x}$  in the dependent voltage source, and determine whether the source is absorbing or delivering power.



Answer:  $p_{2i_x} =$

- (c) [3] In the circuit at right, predict the voltage and current readings,  $v$  and  $i$ , on the voltmeter and ammeter, respectively.

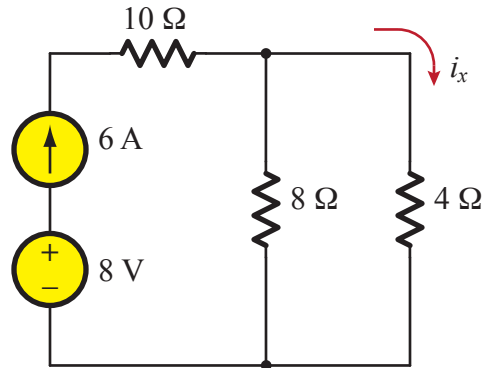


Answer:  $v =$

Answer:  $i =$

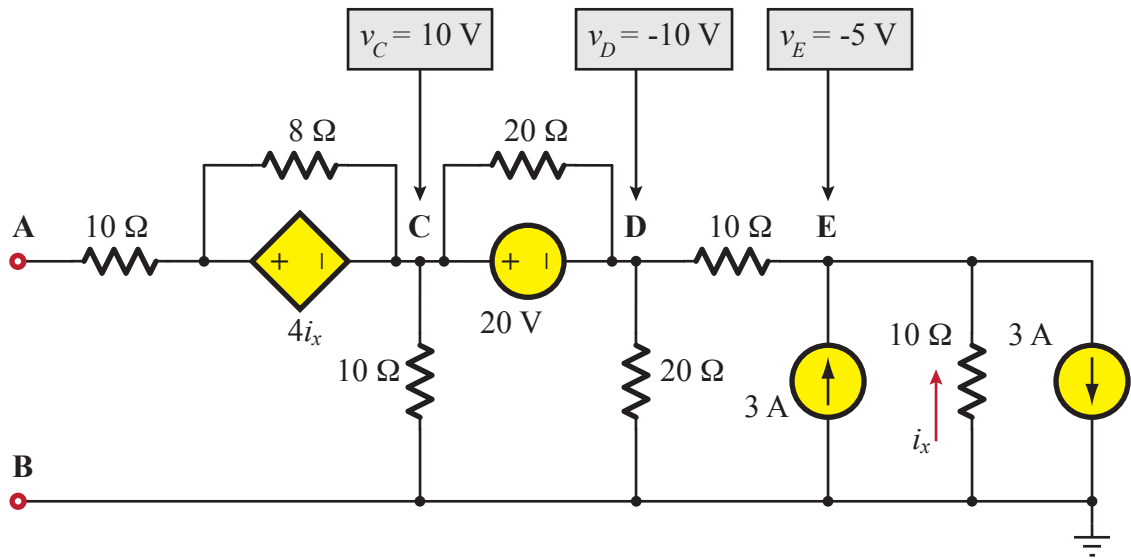
(Question 1, continued ...)

- (d) [3] In the circuit at right, determine  $i_x$  in the  $4\ \Omega$  resistor, as shown.



Answer:  $i_x =$

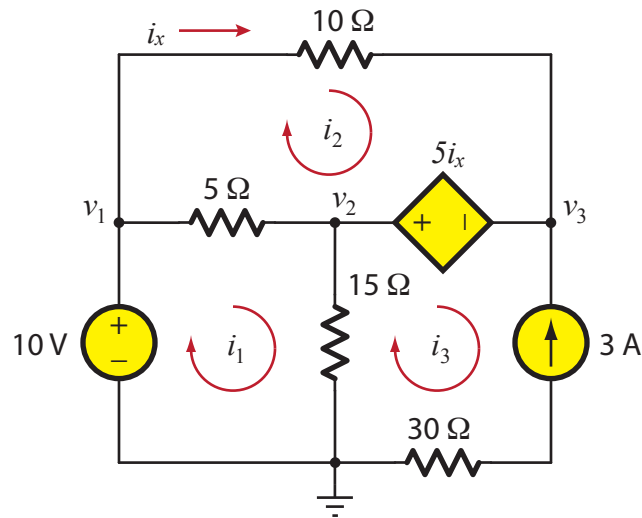
- (e) [3] In the circuit below, the node voltages  $v_C$ ,  $v_D$ ,  $v_E$  are known to be  $v_C = 10$  V,  $v_D = -10$  V, and  $v_E = -5$  V, as indicated. Determine the voltage  $v_{AB}$ .



Answer:  $v_{AB} =$

2. [13 marks.] Consider the circuit below.

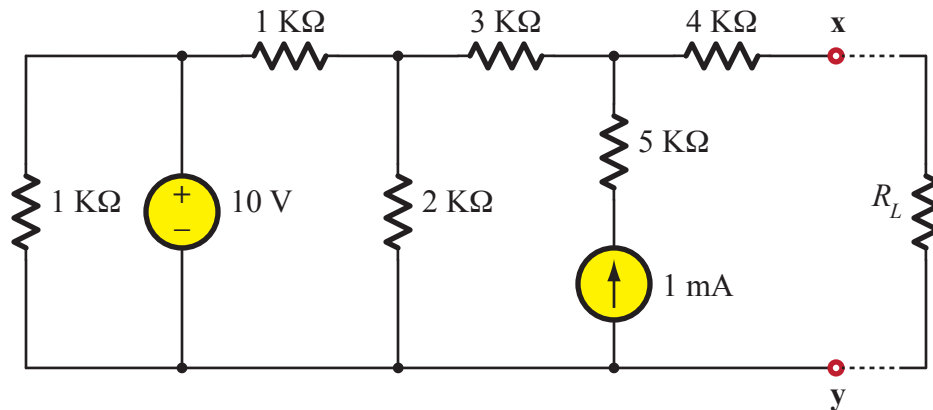
- (a) [7] Use the node-voltage method to find the node voltages  $v_1$ ,  $v_2$ , and  $v_3$ .
- (b) [6] Use the mesh-current method to find the mesh currents  $i_1$ ,  $i_2$ , and  $i_3$ .



*(Question 2, additional workspace ...)*

3. [12 marks.] For the circuit below, derive the Thévenin and Norton equivalent circuits as seen by  $R_L$  at the terminals **x** and **y**, as follows.

- (a) [8] Using *superposition*, determine the Thévenin voltage  $v_t$ .
- (b) [3] Using any method of your choosing, find the Thévenin resistance  $R_t$ .
- (c) [1] Give the Norton equivalent circuit.



*(Question 3, additional workspace ...)*

*(Please do not write in this space.)*

<b>#1 (15)</b>	<b>#2 (13)</b>	<b>#3 (12)</b>	<b>Total (40)</b>