

**University of Toronto
Faculty of Applied Science and Engineering
Department of Electrical and Computer Engineering**

**ECE110S – Electrical Fundamentals
Midterm Test 2 – March 19, 2009, 6:00 – 7:00 p.m.**

$$(e = 1.6 \times 10^{-19} \text{ C}, \varepsilon_0 = 8.85 \times 10^{-12} \text{ F/m}, \mu_0 = 4\pi \times 10^{-7} \text{ H/m}, g = 9.81 \text{ N/kg})$$

ANSWER ALL QUESTIONS ON THESE SHEETS, USING THE BACK SIDE IF NECESSARY.

1. Non-programmable calculators are allowed.
 2. For full marks, you must show methods, state UNITS and compute numerical answers when requested.
 3. Write in PEN. Otherwise, no remarking request will be accepted.
 4. There is one extra blank page at the end for rough work.
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Last Name:

First Name:

Student Number:

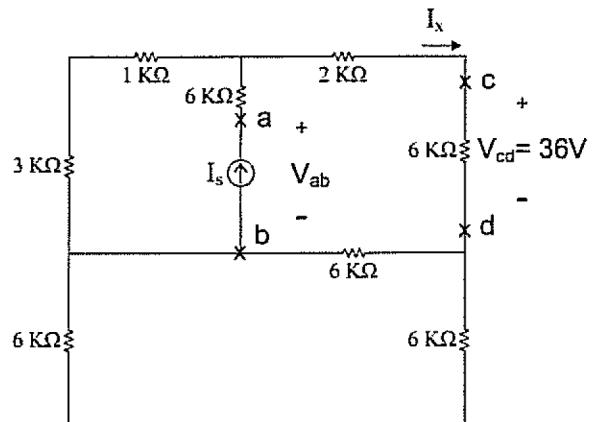
Tutorial Section:

01	WB130	Mon. 3-5 p.m.
02	GB404	Mon. 3-5 p.m.
03	SF3201	Tue. 4-6 p.m.
04	GB405	Tue. 4-6 p.m.
05	GB404	Wed. 4-6 p.m.
06	GB412	Wed. 4-6 p.m.
07	GB404	Wed. 2-4 p.m.
08	GB412	Wed. 2-4 p.m.
09	SF2202	Fri. 4-6 p.m.
10	GB304	Fri. 4-6 p.m.
11	SF3201	Fri. 2-4 p.m.
12	GB412	Fri. 2-4 p.m.

Question	Mark
1	
2	
3	
TOTAL	

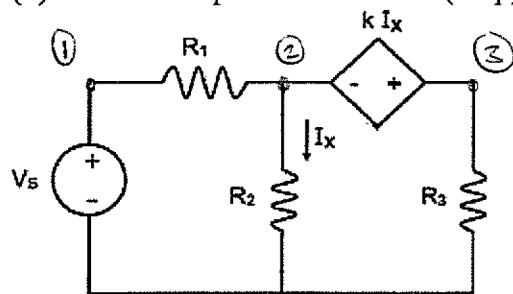
1. [10 marks] For the circuit shown below, use circuit reduction, voltage division, current division, KCL, KVL and Ohm's law to calculate:

- (a) Current I_x . (1 mark)
- (b) Current I_s . (4 marks) (*Hint: You may need to simplify the circuit first*)
- (c) Voltage V_{ab} . (3 marks)
- (d) R_{ab} , the equivalent resistance between the two points a and b seen by the current source. (2 marks)



2. [10 marks] For the circuit shown where V_S , k , R_1 , R_2 and R_3 are constants:

- (a) Write the equations for nodal analysis. (5 marks)
- (b) Write the equations for mesh (loop) analysis. (5 marks)



3. [10 marks] Consider the circuit below. Known parameters are: $R_1 = 50 \Omega$, $R_2 = 20 \Omega$, $R_3 = 50 \Omega$, $R_4 = 100 \Omega$, $R_5 = 80 \Omega$, $V_s = 20 \text{ V}$, and $I_s = 20 \text{ A}$. Determine the following:

- Thevenin equivalent voltage seen by the load. **(4 marks)**
- Thevenin equivalent resistance seen by the load. **(3 marks)**
- What is the power transferred to the load, if the load resistance is $R_L = 32 \Omega$. **(3 marks)**

