

King Fahd University



of Petroleum & Minerals

**Electrical Engineering Department
EE 201 Electric Circuits I
Third Semester (103)**

**Final Exam
Thursday, 18 August 2011
9:00 am – 11:30 am**

Name: _____

ID: _____

Section: _____

Problem	Score	Out of
1 – A		6
1 – B		9
2		20
3		25
4		20
5		20
Total		100

Clearly present your work and show, on the circuit drawing, all the variables used in the calculation.

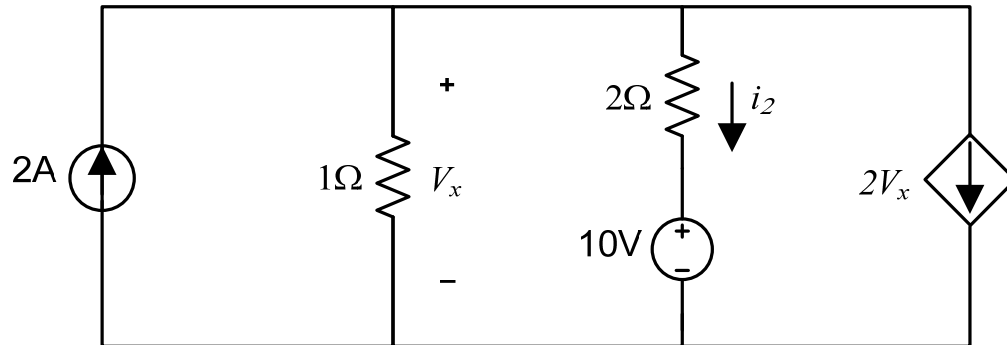
When applicable, make sure to use the specified method to solve the question(s).

Good Luck

Problem 1 - Part A:

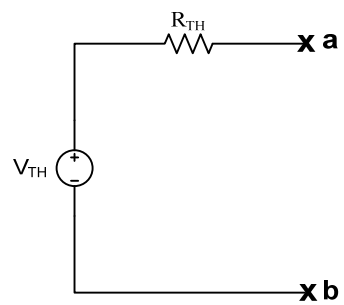
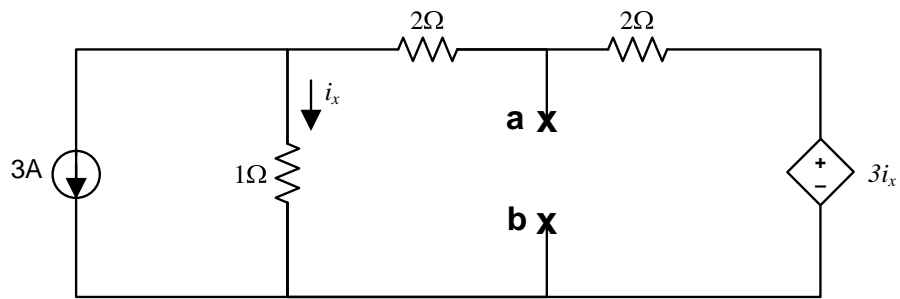
Consider the circuit below. Using ONLY KCL, KVL and Ohm's law:

1. Calculate the voltage V_x .
2. Calculate the current i_2 .



Problem 1 - Part B:

Consider the circuit below. Find the Thevenin equivalent circuit. (Do NOT use the short-circuit current to find the Thevenin resistance).

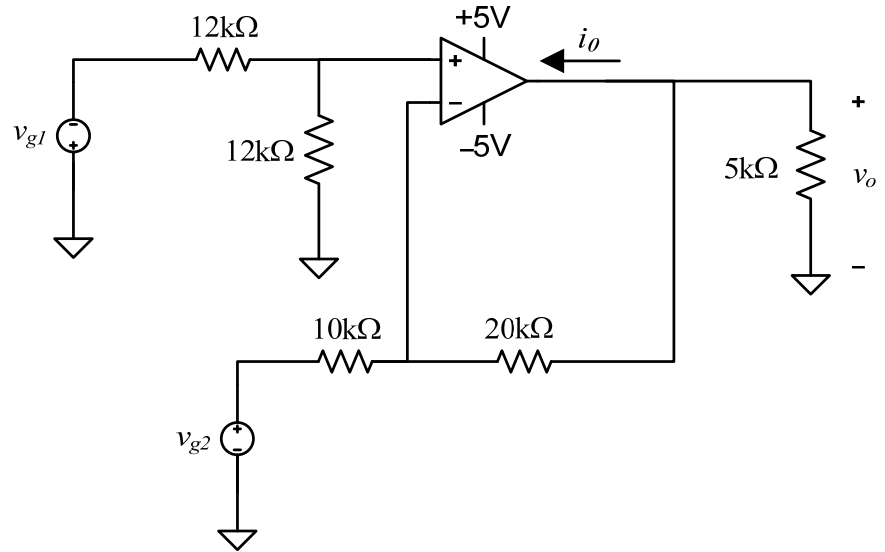


Problem 2:

Consider the circuit below, and assuming that the op amp is ideal.

1. Fill the table below: (show all the calculations.)

V_{g1}	V_{g2}	Output voltage (v_o)
3V	1V	
3V	-1V	
-3V	-1V	



2. For $V_{g1}=3V$, what is the range of values of V_{g2} that will maintain linear operation of the op amp.

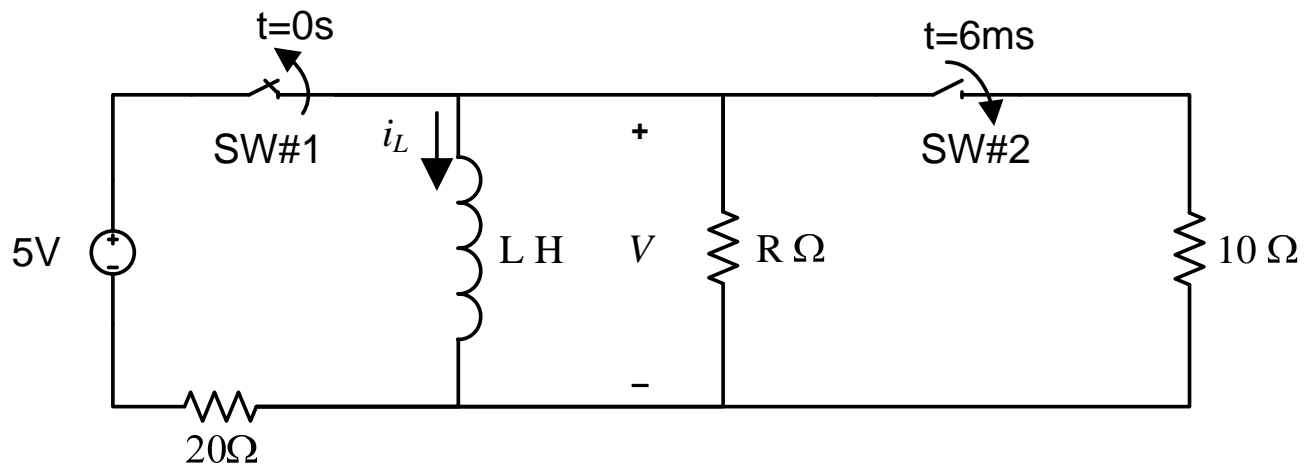
3. For $V_{g1}=3V$ and $V_{g2}=-1V$, find the value of i_o .

Problem 3:

For the circuit below, the switch SW#1 was closed for a long time and switch SW#2 was open for a long time.

At $t=0s$, switch SW#1 was opened (the status of SW#2 was not changed). At $t=6ms$, switch SW#2 was closed (the status of SW#1 was not changed).

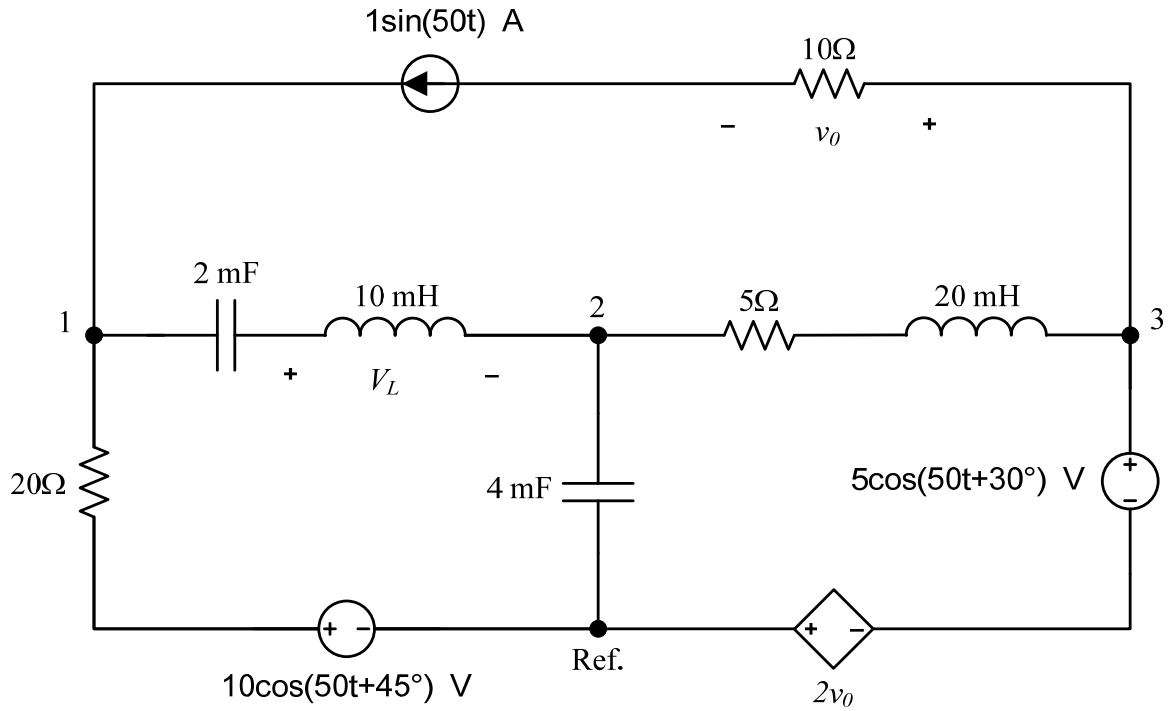
1. Knowing that the initial energy in the inductor was $W(t=0s)=625\mu J$; and that at $t=5ms$, the current through the inductor i_L was $i_L(t=5ms)=50mA$, find the values of the inductance L (H), and the resistance R (Ω).
2. Find the current $i_L(t)$ for $t \geq 0s$.
3. Find the total energy dissipated in the 10Ω resistor.



Problem 4:

Consider the circuit below,

1. Write the node voltage equations in the phasor domain (Do NOT simply or solve).
2. What are the power factor associated with the 20mH inductor, and the reactive factor associated with the 4mF capacitor?
3. Express the phasor voltage associated with V_L as a function of the node voltages and the components' impedances.



Problem 5:

Consider the circuit below.

1. Find the power factor of the line.
2. What is the average power dissipated in the line?
3. What is the complex power associated with the load?
4. Find the element that needs to be connected in shunt with the load (between the terminal a and b) to make its power factor unity ($\text{pf}=1$). (Specify the element type and the value of its impedance).

