KING FAHD UNIVERSITY OF PETROLEUM & MINERALS

ELECTRICAL ENGINEERING DEPARTMENT

SECOND SEMESTER 2009-2010 (092)

Course Title:	**Electric Circuits I**
Course Number:	**EE 201**

Exam Type:	**Final Exam**
Date:	**Monday: June 21, 2010**
Time:	**07:00 – 10:00 pm (3 hours)**

Student Name: _____

Student ID: _____

Section: _____

Serial Number: _____

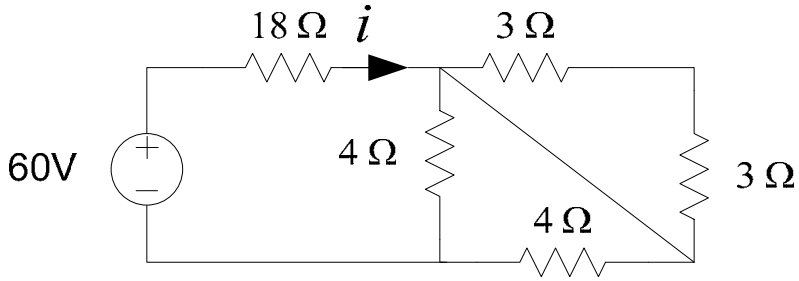
GRADING		
Question 1	**10**	
Question 2	**10**	
Question 3	**10**	
Question 4	**10**	
Question 5	**10**	
Question 6	**10**	
Question 7	**10**	
Total:	**70**	

Be neat, organized, and show all your work and results.

Dr. A. Shaikhi (Coordinator), Dr. O. Hammi, Dr. Z. Al-Akhdar, Dr. A. Zidouri

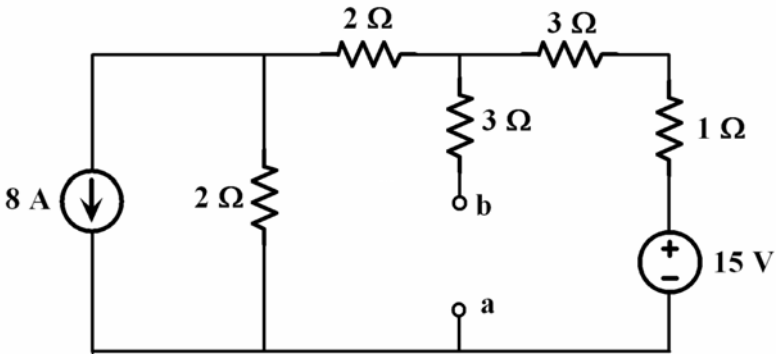
Question 1: (3-4-3 points)

a) Determine the current *i*.



***i* =**

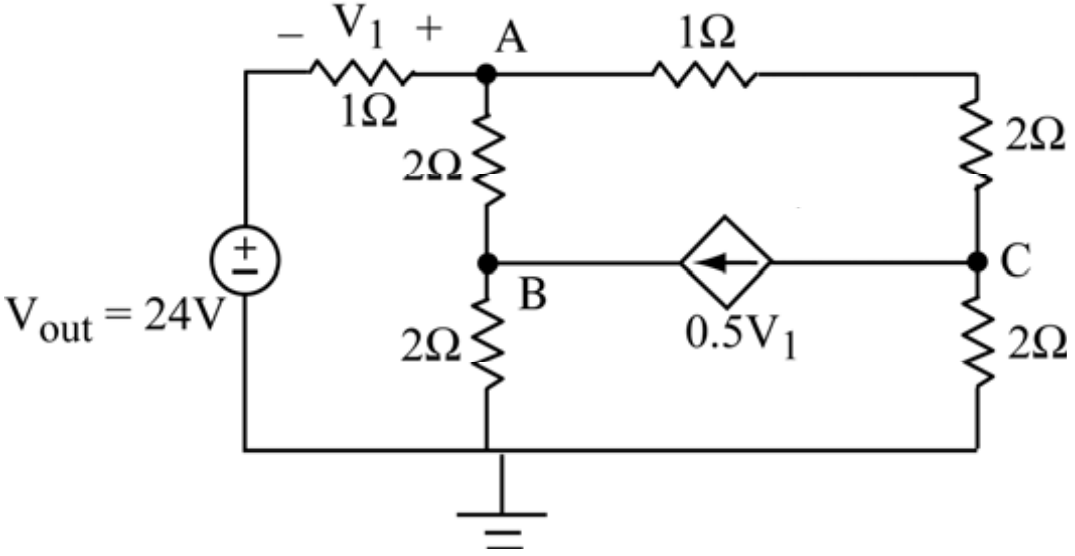
b) Determine Thevenin equivalent resistor R_{TH} with respect to terminals **a-b**.



R_{TH} =

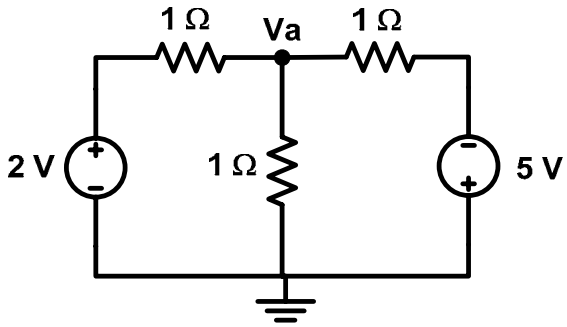
Question 2: (5-5 points)

A) In the circuit below, if nodal voltage $\mathbf{V_A}$ is 16V, find nodal voltage $\mathbf{V_B}$.



V_B =

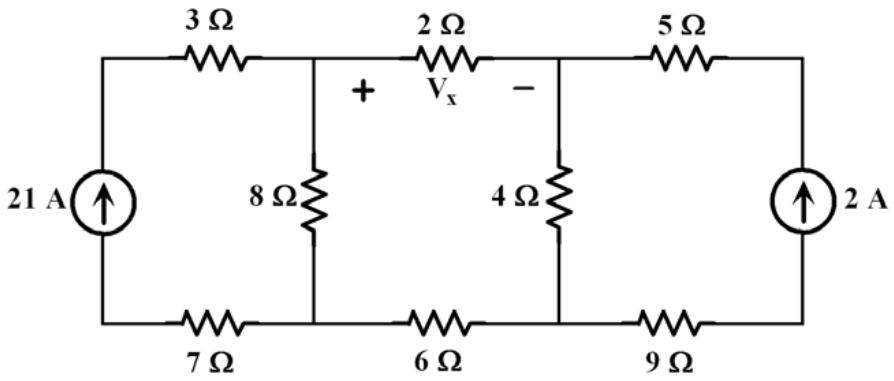
B) Use the node voltage method to find the node voltage **Va**.



Va =

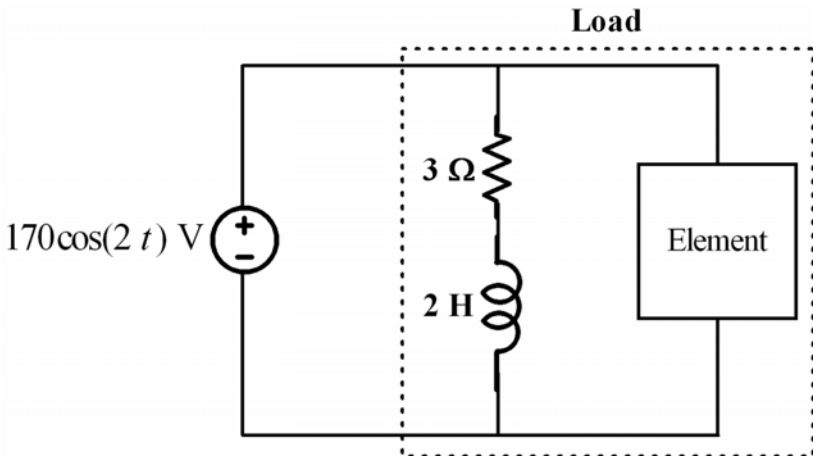
Question 3: (5-5 points)

A) Use the mesh current method to find the voltage V_x.



V_X =

B) Find the electrical element (value and type) in the box that will make the power factor of the load equal one.



element =

Question 4: (10 points)

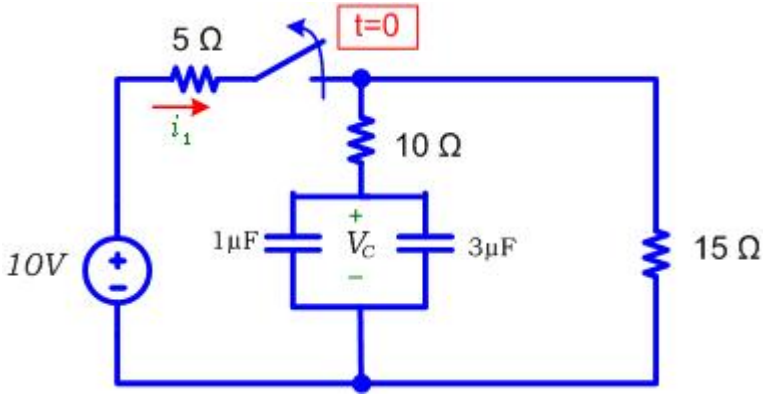
For the circuit below, the switch was closed for a long time and was opened at $t = 0$ sec. Note that $v_c(t)$ is the voltage across the capacitors. Calculate the following:

a) $v_c(t = 0\,\text{sec})$

b) $v_c(t = \infty\,\text{sec})$

c) Time constant, τ

d) $v_c(t), t \geq 0$

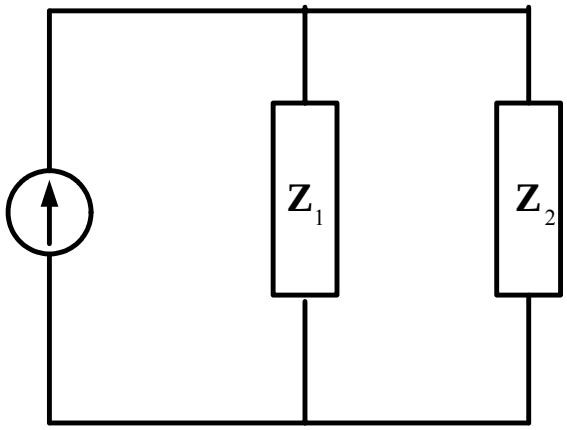


Question 5: (4-2-4 points)

In the circuit shown, load 1 has impedance $\mathbf{Z_1}$ and load 2 has impedance $\mathbf{Z_2}$.

$\mathbf{Z_1}$ absorbs **10** Watts and delivers **15** VARs (Reactive power)
$\mathbf{Z_2}$ absorbs **20** Watts and absorbs **30** VARs (Reactive power)

$i_s(t) = 10\cos(\mathbf{300}t - 45^o)$ A



(a) Find the total complex power generated by the current source?

S_s =

(b) Find the voltage across the current source?

V_s =

(c) If the impedance of $\mathbf{Z}_1$ is given as **R- jX**, find (R and X)?

R =
***X* =**

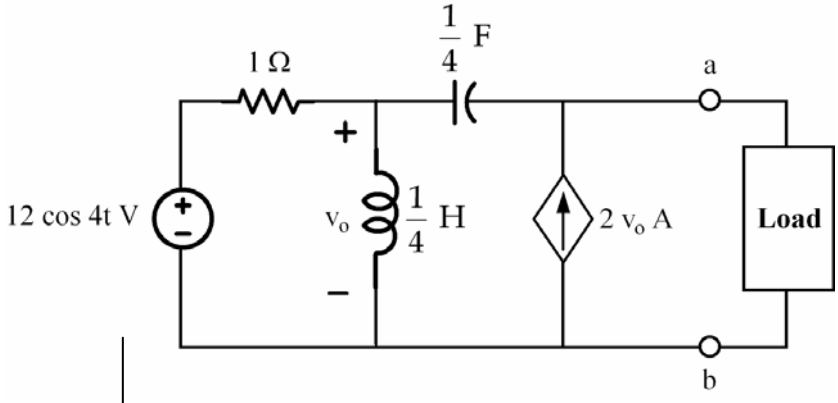
Question 6: (4-3-3 points)

For the circuit shown below:

a) Determine the load impedance that will result in maximum average power being transferred to the load.

b) Determine the maximum average power in [part (a)].

c) Find the values of the elements connected in series (R & L or R & C) of the load impedance that will maximize the average power [part (**a**)].



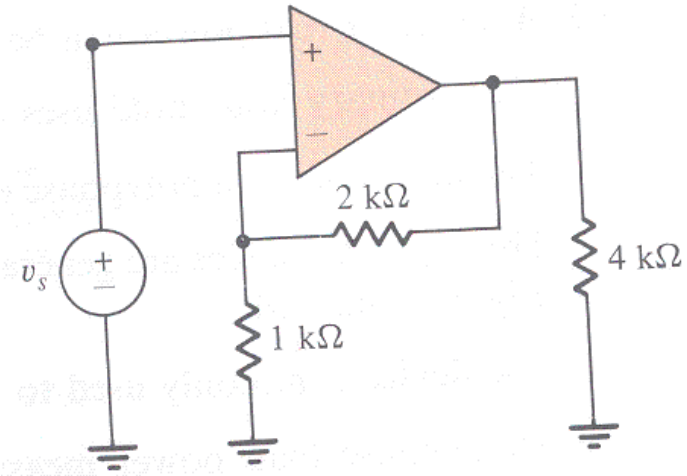
P_{max} =

Z_L =

R =
L* =** ***or
***C* =**

Question 7: (6-4 points)

a) For the op-amp circuit shown the **rms** value of $\mathbf{v_s(t)}$ is **1 V**. Find the average power absorbed by each resistor. (hint: similar to DC)



P_1 = , P_2 = , P_4 =

b) For the circuit below, find the terminal voltage ***Vab*** using superposition: