King Fahd University of Petroleum & Minerals

Electrical Engineering Department
EE 204 Fundamentals of Electric Circuits
Second Semester (122)

Final Exam
26 May 2013
12:30 PM – 3:00 PM

Name: _____

SHOW YOUR WORK FOR ALL QUESTIONS

ID: _____

Section: _____

Serial No.: _____

Instructors

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Dr. HAMMI
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Dr. HUSSEIN

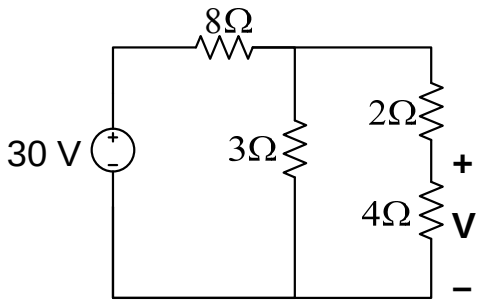
Problem	Score	Out of
1		30
2		10
3		10
4		10
5		10
Total		70

Good Luck!!

Problem 1:
For each of the following **CIRCLE ONLY THE CORRECT ANSWER**

a) In the circuit shown, the voltage V is equal to:

i) 1 V
ii) 2 V
iii) 3 V
iv) 4 V
v) 9 V



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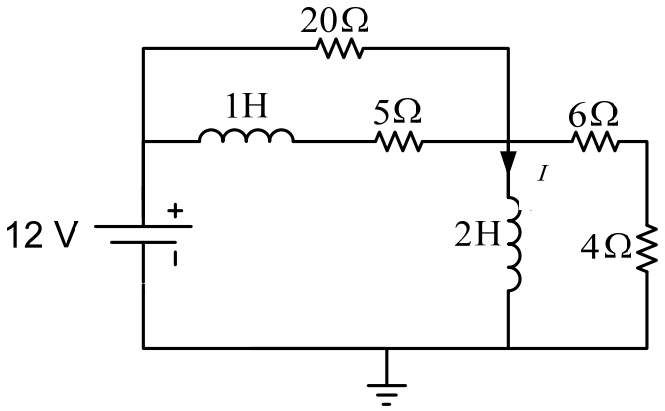
b) In the circuit shown, the current *I* is equal to:

i) 1 A
ii) 0 A
iii) 2 A
iv) 3 A
v) 5 A



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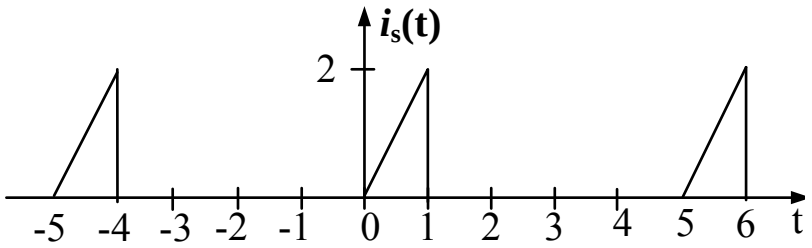
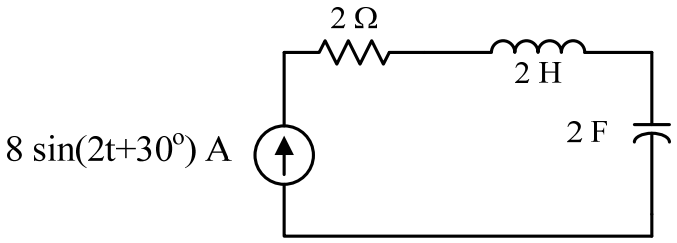
c) The periodic current shown has an effective (rms) value of

i) $\frac{2}{3\sqrt{6}}$ A
ii) $2/\sqrt{15}$ A
iii) $2/\sqrt{3}$ A
iv) $\sqrt{2}$ A
v) $4/\sqrt{3}$ A



d) The reactive power absorbed by the capacitor in the circuit shown is

i) -128 vars
ii) -64 vars
iii) -8 vars
iv) -2 vars
v) -1 var



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e) For the circuit in figure 1.e : The current i(t) is

i) 0
ii) 2 sin(4t) A
iii) 2 cos(4t) A
iv) 4 sin(4t) A
v) 4 cos(4t) A

f) For the circuit in figure 1.e, The voltage v_a(t) is

i) 32 sin(4t) V
ii) 32 cos(4t) V
iii) 32 sin(4t+90°) V
iv) 32 cos(4t+90°) V
v) 64cos(4t+90°) V

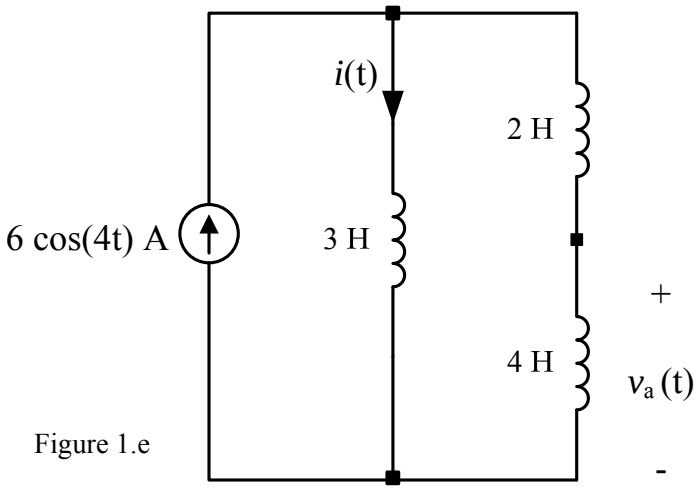

Figure 1.e

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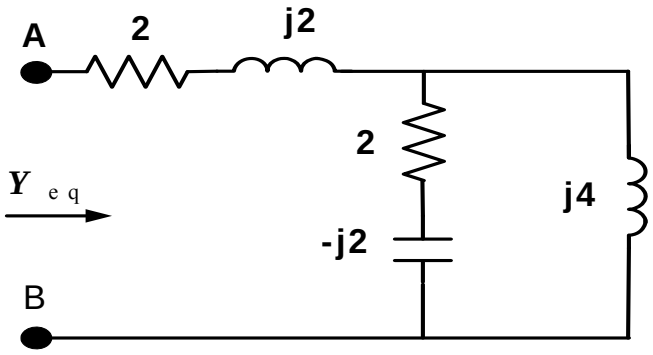
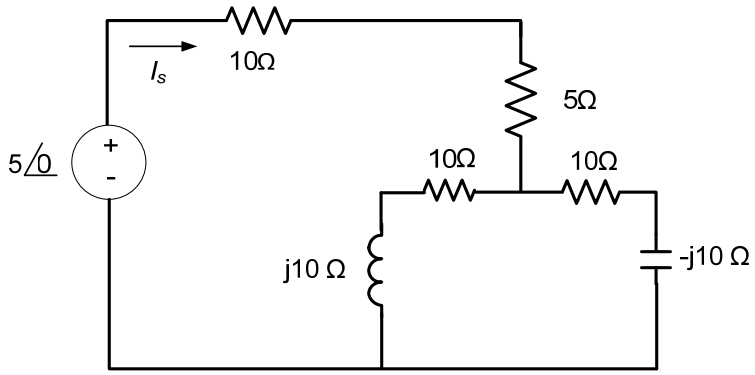
g) For the circuit shown, the equivalent admittance (Y_{eq}) between terminals A and B is

i) $Y_{eq} = 0.15 - j0.05$
ii) $Y_{eq} = 0.15 - j0.2$
iii) $Y_{eq} = -j0.2$
iv) $Y_{eq} = 2.4 + j3.2$
v) $Y_{eq} = 6 + j2$



h) The current I_s in the circuit shown is:

i) $I_s = 0.2 \angle 0$
ii) $I_s = 0.2 \angle -90$
iii) $I_s = 5 \angle -90$
iv) $I_s = 5 \angle 0$
v) $I_s = 5 \angle 90$



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i) A load has a power factor of 0.6 (lagging) and absorbs 8 kvars of reactive power. A capacitor is connected in parallel with this load to improve the power factor from 0.6 to 0.96 lagging. The apparent power for the combined load (the capacitor in parallel with the original load) is

i) 1.75 KVA
ii) 6 KVA
iii) 6.25 KVA
iv) 8 KVA
v) 10 KVA

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j) In the circuit shown, the power dissipated in the resistor is:

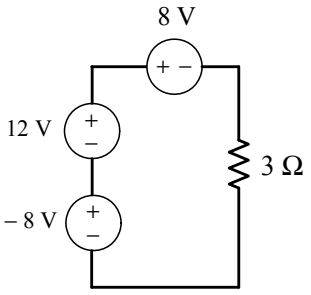
i) 5.333 W

ii) 36 W

iii) 48 W

iv) 90.67 W

v) 261.33 W

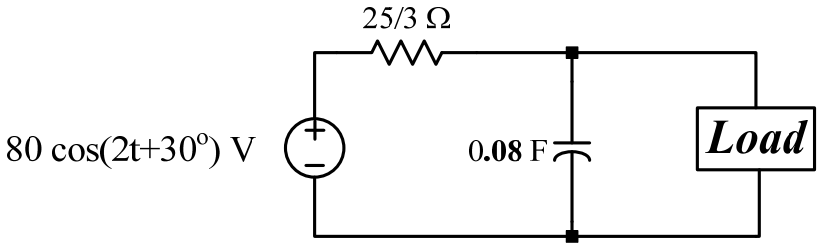


Problem 2:

For the shown circuit:

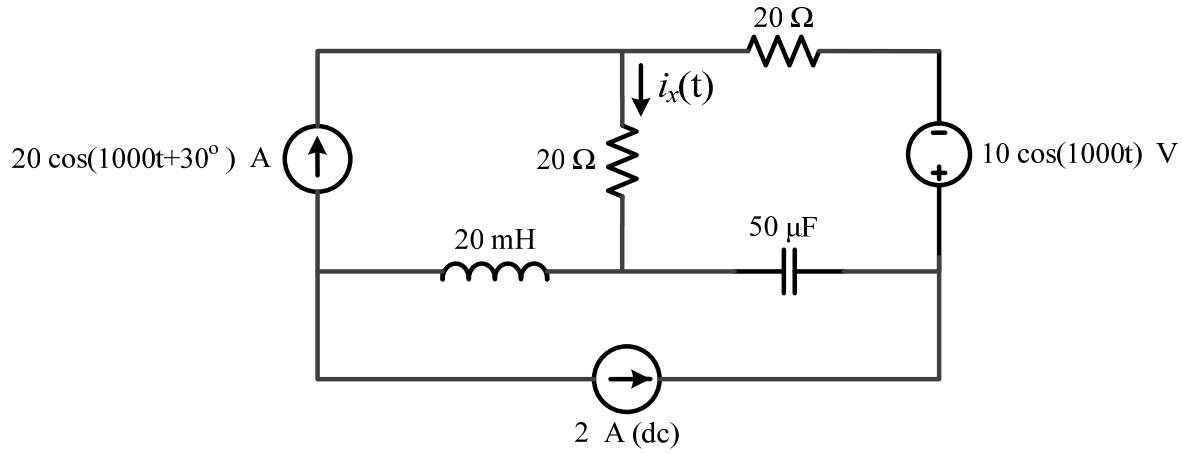
a) Determine the impedance $\mathbf{Z}_L$ of the load such that maximum average power will be delivered to it.

b) Find the maximum average power that can be delivered to the load found in (a).



Problem 3:

Calculate $i_x(t)$ using the superposition principle.



Problem 4:

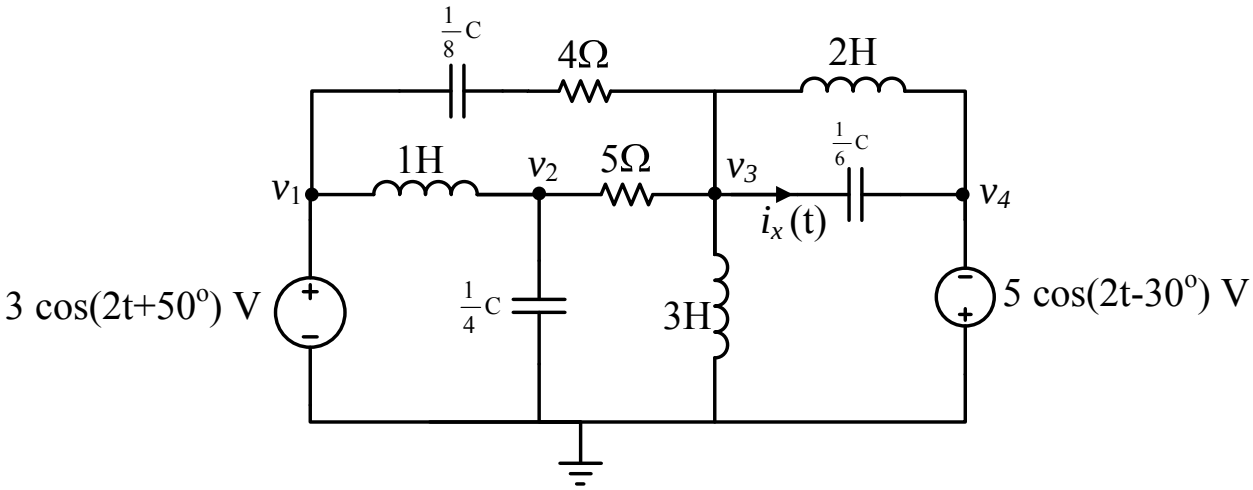
For the circuit shown

i) Draw the corresponding circuit in the phasor domain.

ii) Write the node voltage equations for node v_2 and node v_3 in **the phasor domain**.

iii) Calculate the node voltages $v_2(t)$ and $v_3(t)$.

iv) Use the node voltages to calculate the current $\boldsymbol{I}_x$ in **the phasor domain**.



Problem 5:

In the balanced three-phase circuit shown, $\mathbf{Z}_L = 6 - j8\ \Omega$

a) Determine the value of line voltage $\mathbf{V}_{ab}$, $\mathbf{V}_{bc}$, and $\mathbf{V}_{ac}$.

b) Determine the total average power absorbed by the loads.

c) Determine the power factor of the load. Is it leading or lagging?