King Fahd University of Petroleum & Minerals
Department of Electrical Engineering

EE 204 Fundamentals of Electric Circuits
First Semester (111)
Final Exam
Date: 11 January 2012
Time: 7:00PM – 9:30PM
Location: Exb Center-B

Name: _____

ID: _____

Section: _____

Serial Number _____

Instructors	Section
Dr. S. AL-AHMADI	1 & 9
Dr. M BIN SAEED	2
Dr. A. YAMANI	3 & 6
Dr. Z. AL-AKHDAR	4 & 5
Mr. T NOMAN	7
Dr. M MOHANDES	8
Dr. O. HAMMI	10

Prob.	Score	Out of
1		10
2-a		5
2-b		5
3		10
4		10

Prob.	Score	Out of
5		10
6		10
7		10
Total		70

Problem 1: **(CLEARLY CIRCLE THE BEST ANSWER. NO CREDIT FOR MULTIPLE ANSWERS.)**

1. The effective (rms) value of the periodic current shown is

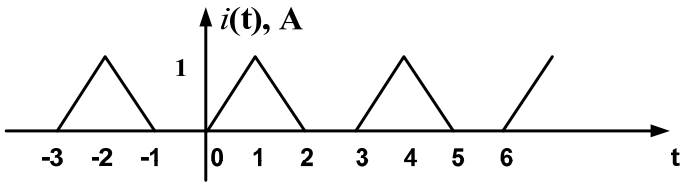
(A) 3

(B) $\frac{1}{\sqrt{3}}$

(C) $\frac{\sqrt{2}}{3}$

(D) $\frac{1}{3}$

(E) None of the above



2. Two resistances R1 and R2 give combined resistance of 4.5 ohms when in series and 1 ohm when in parallel. The resistances are

(A) 3 Ω and 6 Ω

(B) 3 Ω and 9 Ω

(C) 1.5 Ω and 3 Ω

(D) 1.5 Ω and 0.5 Ω

(E) 4.5 Ω and 1 Ω

3. When P = Power, V = Voltage, I = Current, R = Resistance and G = Conductance, which of the following relation is *NOT correct*?

(A) $V = \sqrt{PR}$

(B) $P = V^2 G$

(C) $G = \frac{P}{I^2}$

(D) $I = \sqrt{P / R}$

(E) $P = VI$

4. Determine the complex impedance of the following series arrangement at a frequency of 60 Hz.

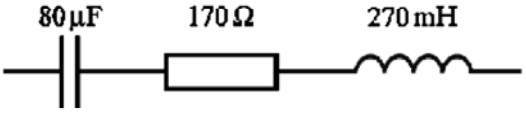
(A) 170 + j69 Ω

(B) 170 + j135 Ω

(C) 239 + j135 Ω

(D) 239 + j69 Ω

(E) 69 +j170 Ω



5. Which of the following combinations of components represents an impedance of 110 + j 314 at a frequency of 100 Hz?

(A) A resistor of 110 Ω in series with a capacitor of 5 F.

(B) An inductor of 50 mH in series with a capacitor of 5 F

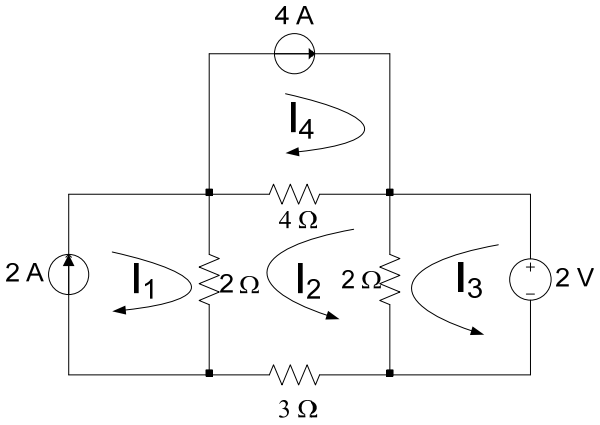
(C) A resistor of 110 Ω in series with an inductor of 500 mH.

(D) A resistor of 314 Ω in series with an inductor of 5 mH.

(E) A resistor of 500 Ω in series with an inductor of 110 mH.

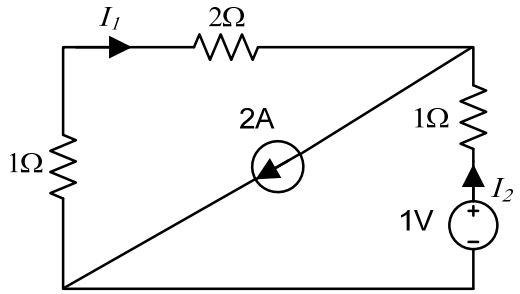
Problem 2

a) Given that $I_3 = -1$ A, *apply the mesh equation method to the circuit shown* to determine the power dissipated by the 4 Ω resistor.



$P_{4\Omega} =$

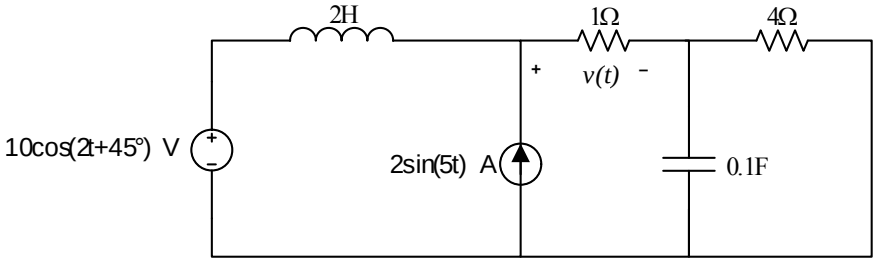
b) In the circuit below, calculate the currents I_1 and I_2 *using superposition technique*.



I_1 =

I_2 =

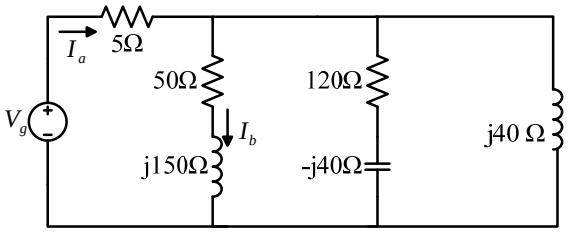
Problem 3:
In the circuit below, calculate the voltage *v(t)*.



v(t) =

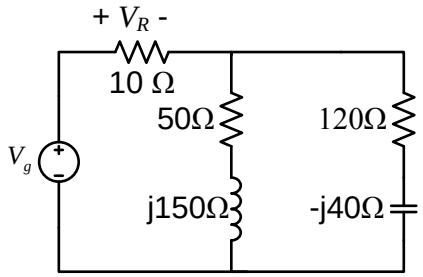
Problem 4:

a) The phasor current $I_a = 4\angle 0^\circ$ A. *Use the current division rule* to find the current I_b.



$I_b =$

b) In the circuit shown below, the sinusoidal voltage source $V_g = 40\angle 45^\circ$ V. *Use the voltage division rule* to find the voltage V_R across the 10 Ω resistor.



$V_R =$

Problem 5:

a) A load absorbs 30 Watts at a leading power factor (pf) of 0.6, calculate (include units):

1. The reactive power.
2. The complex power.
3. The apparent power.
4. What electric element would you use to improve the power factor? Explain?

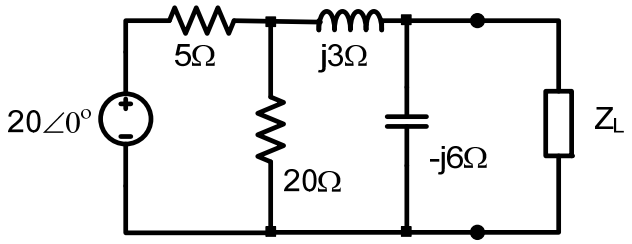
b) The periodic voltage $v(t)$ defined in a period as

$$v(t) = \begin{cases} 4\,, 0 \le t \le 1 \\ -4\,, 1 \le t \le 2 \end{cases}$$

is applied to a 4 Ω resistor. Calculate the average power absorbed by the resistor.

Problem 6:

For the circuit shown determine the impedance Z_L that results in maximum average power transferred to Z_L.



$Z_L =$

Problem 7:

A balanced Y-connected source has phase voltage magnitudes of 220 Vrms. It is connected to a balanced Y-connected load. Each phase load impedance is 10+j10 Ω. Determine the total average power delivered to the load.

P =