ECE 214 — Exam # 1

Estimated time for completion: <1.25 hour 26 February 2013

<u>Rules of the Exam</u>

Rule 1: The examination period begins at 8:00am on Tuesday 26 February 2013 and ends at 9:15am on Tuesday 26 February 2013.

Rule 2: There are four problems. All problems have equal weight.

Rule 3: There is no smoking during the exam.

Rule 4: The exam is closed book and closed notes but you may use your ECE 214 Laboratory Notebook, a ruler, and a calculator.

Name

Problem 1 Shown below are the oscilloscope traces for the two voltage waveforms:

$$v_1(t) = \hat{V}_1 \sin(\omega t + \phi_1)$$

and

$$v_2(t) = \hat{V}_2 \sin(\omega t + \phi_2)$$



For the questions on the next page, circle the "best" answer:

1. What is \hat{V}_1 in Volts?

- (a) 1.5
- (b) 2.4
- (c) 3.0
- (d) 4.8
- (e) None of the above or can not be determined from the information given
- 2. What is \hat{V}_2 in Volts?
 - (a) 1.5
 - (b) 2.4
 - (c) 3.0
 - (d) 4.8
 - (e) None of the above or can not be determined from the information given
- 3. What is ω in radians/sec?
 - (a) 1,000
 - (b) 1,256
 - (c) 2,000
 - (d) 12,560
 - (e) None of the above or can not be determined from the information given
- 4. What is $|\phi_1 \phi_2|$ in degrees?
 - (a) 60
 - (b) 90
 - (c) 120
 - (d) 150
 - (e) None of the above or can not be determined from the information given

Problem 2 Shown below is the oscilloscope trace in XY-mode for the two voltage waveforms:

$$v_x(t) = \hat{V}_x \sin(\omega t + \phi_1)$$

and

$$v_y(t) = \hat{V}_y \sin(\omega t + \phi_2)$$



For the questions on the next page, circle the "best" answer:

1. What is \hat{V}_x in Volts?

- (a) 0.75
- (b) 1.5
- (c) 2.25
- (d) 4.5
- (e) None of the above or can not be determined from the information given
- 2. What is \hat{V}_y in Volts?
 - (a) 0.75
 - (b) 1.5
 - (c) 2.25
 - (d) 4.8
 - (e) None of the above or can not be determined from the information given
- 3. What is ω in radians/sec?
 - (a) 1,500
 - (b) 1,256
 - (c) 6,280
 - (d) 12,560
 - (e) None of the above or can not be determined from the information given
- 4. What is $|\phi_1 \phi_2|$ in degrees?
 - (a) 20
 - (b) 45
 - (c) 110
 - (d) 160
 - (e) None of the above or can not be determined from the information given

Problem 3 Consider the circuit shown below:



What is the Voltage V_{AB} in this circuit?

If a Digital Volt Meter (DVM) having an input Resistance of 1 M Ω is placed across terminals "A" and "B," what voltage V_{AB} is measured?

Problem 4 For the following questions refer to Labs #3 and #4.

- 1. If Q = 50 for a 0.78 mH inductor, what is the ESR at 1 kHz?
- 2. In the procedure for Lab #3, Part B–3, you were asked to:

Set the function generator to output a sine wave of 5 Vp. Determine the frequency at which the reactance of the capacitor cancels the reactance of the inductor. Record this frequency and measure the magnitudes of V_{OUT} and V_{IN} at this frequency. Calculate the equivalent impedance of the inductor and capacitor at this frequency and record the results in your notebook.

- (a) What was the equivalent impedance of the capacitor?
- (b) What was the equivalent impedance of the inductor?

Do these values make sense? _____. Explain why.

3. In Lab #4, what was the measured time constant of the voltage from the Agilent E3630A DC power supply when switched off? _____