ECE 214 Linear Circuits Lab — Exam#1

Estimated time for completion: 1.25 hours

21 February 2012

Name: _____

Notes:

This is a closed book exam except you may use your ECE 214 Laboratory Notebook and a calculator.

ECE 214 Laboratory Notebooks must be turned–in before 5pm on Thursday 23 February 2012.

Problem 1: Equipment loading

In lab, you measured the input impedance of your digital volt meter (DVM). Answer the following questions regarding this measurement:

1. Draw the circuit you used to determine the impedance of your DVM:

- 2. What was the measured input impedance of your DVM? _____
- 3. On what page of your laboratory notebook does this measurement appear?
- 4. If you use your DVM to measure the voltage V_R across the $5M\Omega$ resistor in the circuit shown below, what voltage would you measure?



Figure 1: Circuit to be measured using your DVM.

Problem 2: Lab #3 – Circuits with Inductors

In Lab #3, you analyzed the R–L Circuit shown below.



R–L Circuit analyzed in Lab #3.

- 1. In Laboratory Procedure Part A, number 6, you determined the frequencies when the phase shift between V_{IN} and V_{OUT} was 45 degrees. and recorded these values in your notebook.
 - (a) At what frequencies was the measured phase shift 45°? _____, _____
 - (b) What page number of your notebook is this information recorded?
- 2. In the post–lab, you generated a MatLab plot showing the measured and predicted magnitude of V_{OUT} as a function of frequency.
 - (a) On what page of your notebook is this graph located? _____
 - (b) What was the predicted magnitude of V_{OUT} at 100 kHz?
 - (c) What was the measured magnitude of V_{OUT} at 100 kHz?
 - (d) Was is the percent error in the measurement?
 - (e) Briefly explain a possible cause for this error:

Problem 3: Use of a function generator and oscilloscope

You generate the following signal using the HP33120A function generator and display it on the oscilloscope using dc input coupling:



Signal from HP33120A function generator as it appears on the oscilloscope.

1. What is the frequency of the signal in Hz? _____

2. What is the frequency of the signal in radians/sec?

- 3. What is the amplitude of the signal in V? _____
- 4. What is the DC offset of the signal in V? _____

In order to generate this signal using the HP33120A function generator:

- 1. What value do you enter for the magnitude? ______
- 2. What value do you enter for the offset? _____

Sketch on the graph below how this signal would appear on the oscilloscope when using ac input coupling



How signal would appear on the scope with AC coupling.

The phase difference between two signals is determined using the scope in the XY mode and the Lissajous figure shown below is obtained.



- 1. What is the ratio of V_1 / V_2 in dB? _____
- 2. What is the phase angle between V_1 and V_2 ?

Problem 4: Series RLC Circuit

The series RLC circuit shown below is driven with a square wave signal from 0 to 5 V and a period of 100 ms. At a falling edge of the input signal, the scope is triggered and the voltage across the capacitor is measured on an oscilloscope. The oscilloscope trace is shown below. Assume the scope does not load the circuit.





What is R? _____

What is L? _____