ECE 214 Linear Circuits Lab — Exam # 1

29 June 2011

Rules of the Exam

Rule 1: You have 48 hours to complete the exam. This exam is open–book and take–home.

Rule 2: There are a total of five questions. Each question has equal weight.

Rule 3: Either drop off your solutions or e-mail your solutions to me within 48 hours of receiving this exam.

Rule 4: Do your own work! During the examination period, you **may not** consult or communicate, by any means, with any currently living human being regarding this exam. Hence, do not discuss the exam problems or your work on this exam with anyone. Doing so will be considered a violation of the Student Conduct Code and offenders will be referred to the Office of Judicial Affairs.

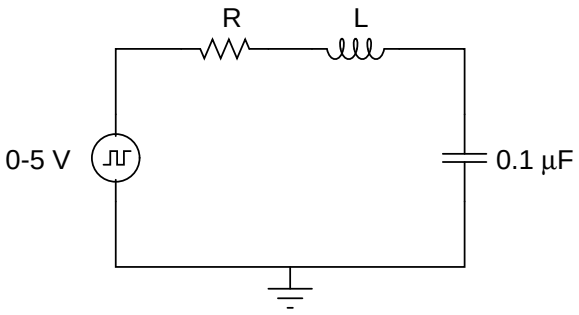
Rule 5: Show all work and **intermediate steps** in your solutions. clearly state all assumptions. Be neat!!!

Have FUN!!!

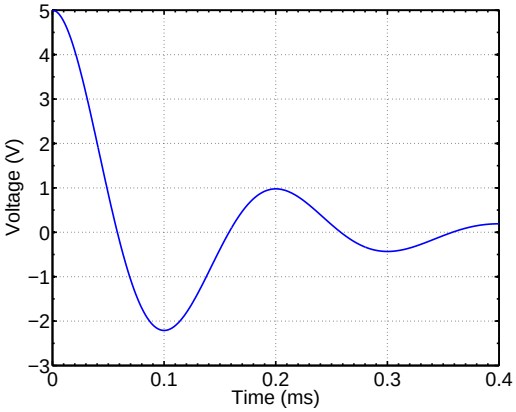
Name: _____

Problem 1: Series RLC Circuit

The series RLC circuit shown in Figure 1(a) 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 as shown in Figure 1(b). Assume the scope does not load the circuit.



(a) RLC Circuit under test.



(b) Voltage across the capacitor at a falling edge of the input signal.

Figure 1: Series RLC Circuit.

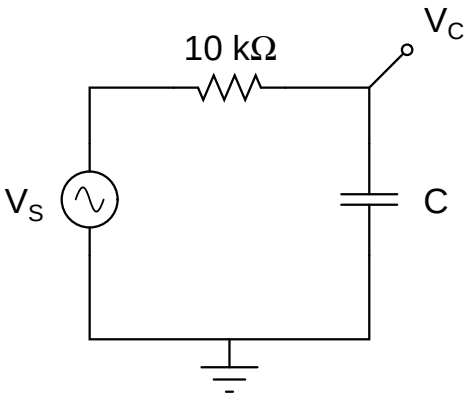
What is R? _____

What is L? _____

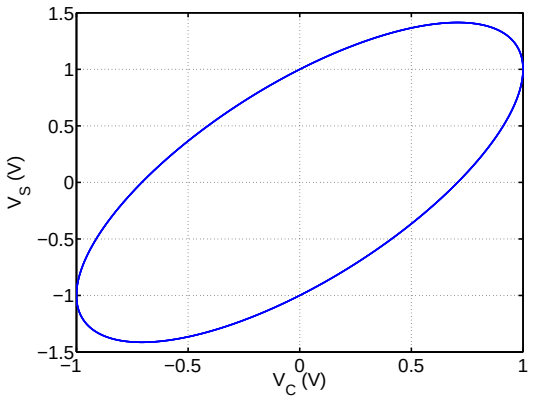
Name: _____

Problem 2: 1st Order RC Circuit

The RC circuit shown in Figure 2(a) is driven with a sinusoidal signal with a peak voltage of 1.414 V. At a frequency of 2.5 kHz, V_S and V_C are measured on a scope using XY mode and the Lissajous figure shown in Figure 2(b) is obtained. Assume the scope does not load the circuit.



(a) RC Circuit under test.



(b) Oscilloscope trace showing V_C on the y–axis and V_S on the x–axis.

Figure 2: RC Circuit.

What is C? _____

Name: _____

Problem 3: 1st Order RL Circuit

In the procedure for Lab #3, what frequency produced the 45° phase shift measured in Part A, step #5.

Measured frequency: _____

Name: _____

Problem 4: Instrumentation Question

The Tenma 72–1025 LCR meter is used to measure the series resistance between terminals A and B for the circuit shown in Figure 4 at a frequency of 1 kHz.

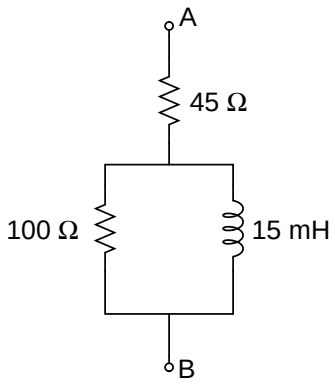


Figure 4: Circuit to be measured on the LCR meter.

What series resistance would you obtain? _____

Name: _____

Problem 5: Circuit Loading

A two–year–old constructs the circuit shown in Figure 5 and asks:

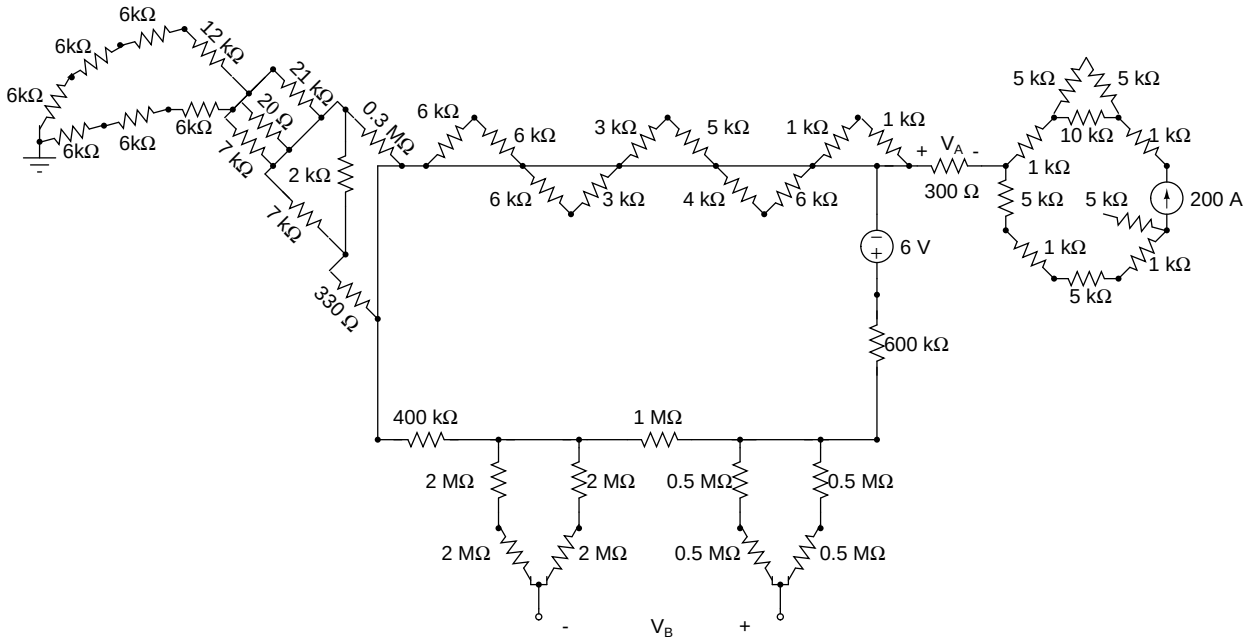


Figure 5: Circuit assembled by 2–year old.

What is V_A? _____ What is V_B? _____

If the voltages are measured using the DVM with an input impedance of 1 MΩ,

what are the measured values of V_A? _____and V_B? _____