ECE 214 Linear Circuits Lab — Exam # 2

19 April 2011

Rules of the Exam

- Rule 1: There are three questions. Each question has equal weight.
- **Rule 2:** You have 75 minutes to complete the exam and may use your ECE 214 Engineering Notebook and a calculator.
- Rule 3: Show all work and intermediate steps in your solutions. clearly state all assumptions. Be neat!!!

Name

Have FUN!!!

Problem 1: OpAmp Circuit

Consider the OpAmp circuit shown below. Assume the OpAmp is ideal.



For the input voltage V_{IN} shown on page 3, plot the output voltage V_{OUT} as a function of time. Make sure to label the voltage levels on the y-axis.



Problem 2: Low Pass Filter

Use the results obtained from the low pass filter you designed in Lab 7 and your knowledge of filters, signals and decibels to answer the following questions:

- 1 When a 2 V peak–to–peak triangular wave with a frequency of 5 kHz was applied to your filter, how far below the fundamental frequency was the 3rd harmonic signal in dB?
- 2 When a 5 V peak-to-peak triangular wave with a frequency of 5 kHz is applied to your filter, how far below the fundamental frequency will the 3rd harmonic signal be in dB?
- 3 When a 2 V peak-to-peak **square wave** with a frequency of 5 kHz is applied to your filter, how far below the fundamental frequency will the 3rd harmonic signal be in dB?

Problem 3: Energy / Power Question

In the circuit below, the 1A source delivers no power and absorbs no power. The circuit dissipates a total of 170 W of power and stores 10 mJ of energy. Determine the values of R_1 , R_2 and C.

