# 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!!!

## Problem 1: OpAmp Circuit

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


For the input voltage $V_{\text {IN }}$ shown on page 3, plot the output voltage $V_{\text {OUT }}$ 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 $C$.


$$
\begin{aligned}
& R_{1}= \\
& R_{2}= \\
& C= \\
&
\end{aligned}
$$

