

**ECE 300 Signals and Systems**  
**Laboratory Practical**  
Winter 2006-2007

Name: \_\_\_\_\_

Station: \_\_\_\_\_

- You must work by yourself.
- You may use only your lab notebook and your laptop running MATLAB.  
You may use any MATLAB code you have written for this course.
- All answers should be expressed in the customary form, including units.
- Sloppy work will not be graded.
- Include all of your work on this exam.

**Problem 1.** (25 points)

You are to use the MATLAB program you wrote in **Lab 4** (or some variation if it) for this problem. Assume the periodic function  $x(t)$  is defined over one period as

$$x(t) = \begin{cases} 2 & 0 \leq t < 1 \\ 1 & 1 \leq t < 2 \\ 0 & 2 \leq t < 3 \end{cases}$$

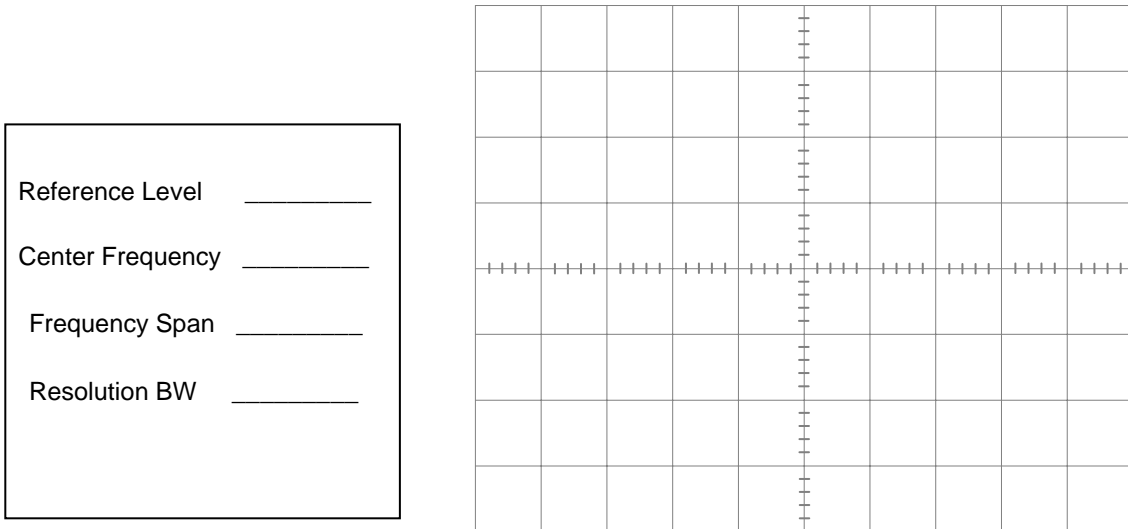
- a. Plot  $x(t)$  and its Fourier series representation using 9 terms. Use your name for the (Matlab generated) title of the graph. Attach the plot to this sheet.
- b. Design an analog Butterworth bandpass filter that removes all harmonics except the 1<sup>st</sup> harmonic. Plot the output signal  $y(t)$ . Use your name for the (Matlab generated) title of the graph. Attach the plot to this sheet. (You may combine the plots for part **a** and part **b** onto one graph if you wish.)

**Problem 2.** (25 points)

Using appropriate equipment, create a **symmetric** triangle wave with 0.2 V peak-to-peak amplitude, 50 mV DC value, and frequency 200 kHz.

- a. Draw the spectrum of the signal on the plot provided, indicating component powers in appropriate units. Indicate all important settings by name and value, and include terms between 0 and 1100 kHz.
- b. Identify the magnitude **in dBmV** and frequency for the first three important spectral components in the chart below.

**Signal Spectrum**



Term	Amplitude (dBmV)	Frequency (Hz)
<b>1</b>		
<b>2</b>		
<b>3</b>		