ELEC 243
Problem Set 4
Exam Section
Due: February 13, 2015

Exam Cover Sheet

Exam problems begin on the next page.

There is one problem this week. It has no time limit and requires the use of Matlab or other suitable programming language.

Before beginning you should read the following guidelines:

- All exam problems are pledged work.

- You may not discuss any problem with anyone other than the instructor.

- Unless otherwise specified, you **MAY** utilize:

    - A calculator.
    - Your textbook, class notes, and any material on or *directly* linked to the class web page.
    - A table of integrals.

- Unless otherwise specified, you **MAY NOT** utilize:

    - Matlab or any other computer software.
    - Any reference material other than those listed above.

- "Find" means to determine a numerical value or an algebraic expression for the indicated quantity or function. "Sketch" or "plot" means to draw a graph of the indicated function, not necessarily to accurate scale, but with labeled axes and important values indicated.

- Some problems will have a time limit. This will be indicated at the beginning of the problem itself and on the cover sheet. If no time limit is specified, you may use as much time as desired, subject to the solution being handed in on time.

When you are ready to begin, turn the page.

E4.1 There is no time limit for this problem. You may utilize Matlab or other suitable programming language.

The periodic signal $x(t)$ may be represented by the Fourier cosine series

$$x(t) = a_0 + \sum_{n=1}^{+\infty} a_n \cos(2\pi n f_0 t + \theta_n)$$

where $f_0 = \frac{1}{T}$ is the fundamental frequency. The coefficients are

n	a_n	θ_n
0	0.50	
1	1.00	$\pi/4$
2	0.75	$\pi/2$

(a) Find all of the non-zero coefficients, c_n, of the complex exponential Fourier series

$$x(t) = \sum_{n=-\infty}^{+\infty} c_n \exp(j2\pi n f_0 t)$$

(b) For a fundamental frequency of $f_0 = 1$Hz, compute and plot one period of $x(t)$ using Matlab or other appropriate programming language. Include a copy of your program with your solution.

[For this problem "plot" has a stronger meaning than given in the exam guidelines. Specifically your graph should be to accurate scale with labeled tick marks on both axes.]