ELEN3801 - Fall 2009
Homework 9

Due Thursday November 19th at the **beginning** of class
(Mudd 227 9:10am)[1]
Carefully justify ALL your answers

9.1 - Solve problem 4.5-1 of the textbook.

9.2 - Solve problem 4.6-2 of the textbook.

9.3 - Solve problem 5.1-3 of the textbook.

9.4 - Solve problem 5.1-2 of the textbook.

9.5 - **Sampling with a train of pulses:** When we proved the sampling theorem in class we used a train of impulses to do the sampling. In this question we will see what happens if we use a train of pulses instead. Let $f(t) = \text{sinc}(200\pi t)$, and let

$$p_{T_s}(t) = \sum_{k=-\infty}^{\infty} \text{rect}\left(\frac{t - 0.004k}{0.0008}\right) ,$$

be a train of pulses. This signal is depicted in the figure below.

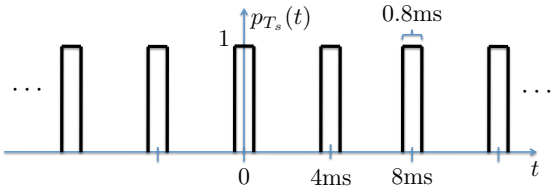

Figure 1: A train of pulses.

a) Compute the Fourier series of $p_{T_s}(t)$.
b) What is the spectrum of the sampled signal $\bar{f}(t) = f(t)p_{T_s}(t)$? **Hint:** proceed as we did in class.
c) Explain if we can recover $f(t)$ from $\bar{f}(t)$.
d) If $\bar{f}(t)$ is passed through an ideal lowpass filter of bandwidth 100Hz and unit gain what is the output? What is the filter output if the bandwidth is B Hz, where $100 < B < 150$? What happens if $B > 150$?

Suggestion: See the discussion on page 328-329 of the textbook.

[1] You can always hand-in the homework earlier if you so desire - just give it **in hand** to me or to one of the TAs, or leave it in **my** mailbox (in the EE office on the 13th floor of Mudd).