EE354 **Homework #7** **Spring 2010**

1. Problem 2.7
2. Problem 2.18
3. Consider a triangle waveform with amplitude of 1V, frequency of 2 Hz, and offset of 0.5V (shown below in Figure 1)

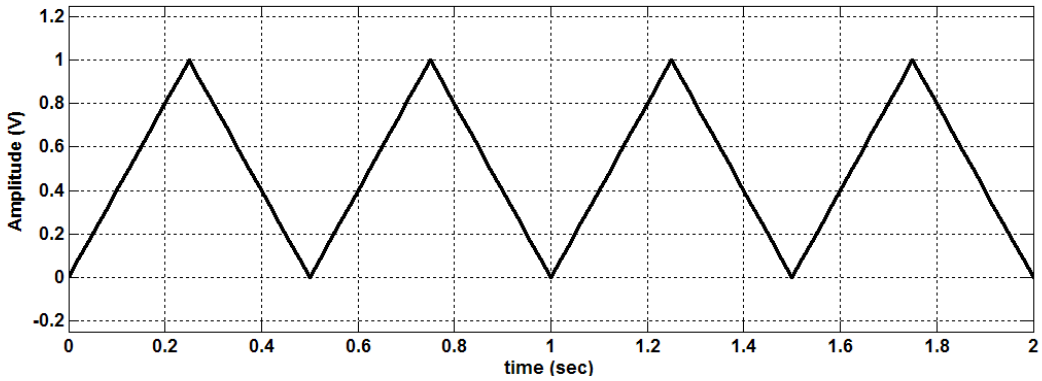

Figure 1: Triangle Waveform

Using Matlab, generate a PWM and PAM representation of $s(t)$. Add noise to both signals, and design a demodulator to recover an estimate of the original signal from the PAM/PWM signal (Hint: See the Powerpoint slides for Lecture 17). For both PAM and PWM, plot (a) the original signal, (b) the noise-free PAM/PWM modulated signal, (c) the noisy modulated signal, and (d) the recovered signal.

For this problem, you can make use of the following Matlab functions:

`sawtooth(2.*pi.*fc.*t, 0.5)` will generate a triangle wave of frequency fc.

`pam_pwm_mod(x, fs_sig, N_mod, t_end, noise_amp)` (available on the course website) will produce both the noise-free and noisy PAM/PWM signals. x is the original input signal, fs_sig is the sampling frequency of the original signal, N_mod is the number of samples per PAM/PWM signal, t_end is the end time of the original input signal, and noise_amp is the amplitude of the noise.

`filter_audio(x, fco, fs)` (available on the course website) can be used to low-pass filter a signal. The 3dB cutoff frequency is fco, and fs is the sampling frequency.