Program Assignment #4, EE5350

1. Write a function called "RECON" with parameters xx, xr N_x, N_1, and N_h. When RECON is called, xx is an input array having at least N_x samples, most of which are zero. The output array is stored in array xr on return to the main program. RECON reconstructs the missing or zero samples of xx using band-limited interpolation, as follows:

(a) Generates a lowpass filter as $h(n) = \text{sinc}((n-1-N_h/2)/N_1)$ for $n = 1$ to N_h

(b) Filters $xx(n)$ as $y(n) = xx(n)*h(n)$, using function Conv from program assignment 1 or 2.

(c) Shifts $y(n)$ as $xr(n) = y(n+ N_h/2)$ for $n = 1$ to N_x

2. Write a main program which;

(a) Defines and plots the array x with N_x=100 and

$$x(n) = \cos(C \cdot n^2), \qquad 1 \le n \le N_x$$

where C = .01.

(b) Plots the array xx with N_x = 100 and $xx(n)= x(n)$ if n is a multiple of N_1=3 and zero elsewhere. The signal xx(n) is x(n) after being decimated with a decimation factor of 3 and then having zero-fill between samples.

(c) Reconstructs xr(n) (the reconstructed x(n)) from xx(n) by calling RECON, and plots the reconstructed function xr(n). Pick a good **even** value of N_h .

(d) Plots the error function $e(n)=x(n)-xr(n)$ for N_e=100.

3. Turn in the computer listings of the main program and the function RECON, the inputs x and xx, and the outputs xr(n) and e(n).