EE432 Fall 2008 PS08 (Due: Wed 11/12/08)

1. Classify the following systems as FIR or IIR, as causal or non-causal, find the system impulse response, and determine if the system is BIBO stable or not.

   a. y[n] = ½ (x[n] + x[n-1]).

   b. y[n] = x[n-1] - (0.25) y[n-1].

   c. y[n] = x[n-1] - 2 y[n-1].

   d. 2 y[n] + 6 y[n-1] = x[n] - x[n-2].

2. Recreate parts c-g of Figure 16-1 from the text using a 3 x 2 subplot, as follows. Note: the plot indices for the time domain should start with n=0. Label the plots.

   a. In MATLAB, create a 101 point sinc function centered at n=51, that has been time expanded by a factor of 10, as follows: n=0:100, x=sinc((n-51)/10).

   b. Create a Hamming or Blackman window (type "help window" at the command line) to figure out how to use it. Call this variable w.

   c. Zeropad x[n] with 100 zeros at the end of the sinc, and zeropad w[n] with the same number of zeros.

   d. Plot the zeropadded x[n], and indicate the abrupt end (Figure(16-1c). Plot the zeropadded window you chose (Figure 16-1e).

   e. Plot the magnitude of the DFT of the zeropadded x[n] using your DFT function (or you could use the FFT function, if you use it wisely) (Figure 16-1d).

   f. Multiply the x[n] signal with the window, then take the DFT of the product. Plot the magnitude of this DFT (Fig. 16-1g).

   g. Now that you see the plots—what were the effects of the windowing?