ECE 376 - Homework #12

Digital Filters - Due Monday, April 22nd

Filters in the z-Plane

1) Assume G(s) is a low-pass filter with real poles:

$$G(s) = \left(\frac{500}{(s+3)(s+7)(s+10)} \right)$$

Design a digital filter, G(z), which has approximately the same gain vs. frequency as G(s). Assume a sampling rate of T = 0.01 second.

Plot the gain vs. frequency for both filters from 0 to 50 rad/sec.

2) Assume G(s) is the following band-pass filter:

$$G(s) = \left(\frac{10s}{(s+5+j20)(s+5-j20)} \right)$$

Design a digital filter, G(z), which has approximately the same gain vs. frequency as G(s). Assume a sampling rate of T = 0.01 second.

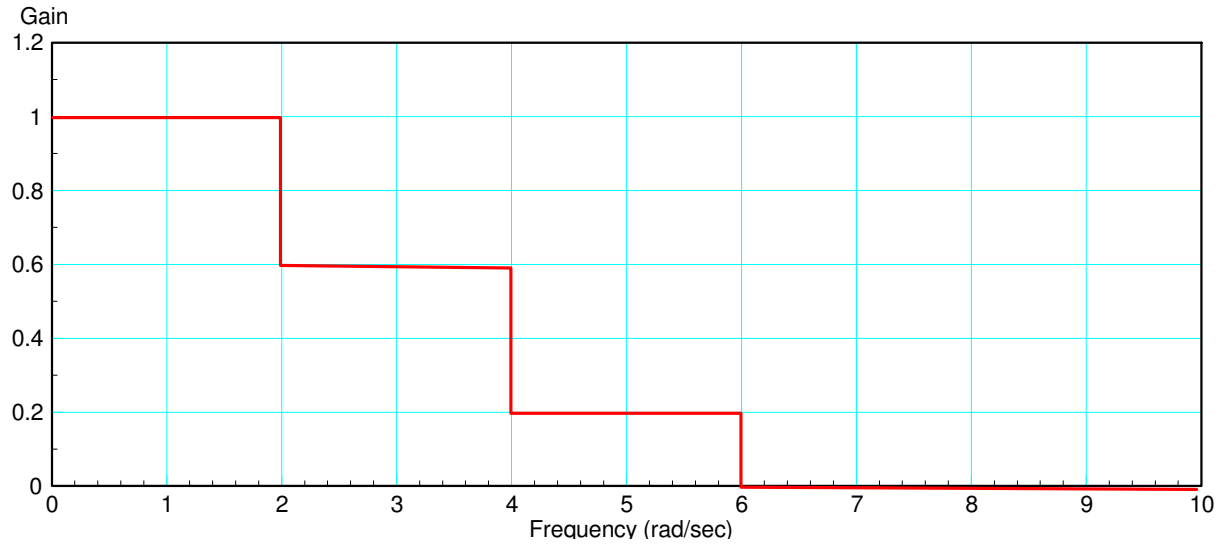
Plot the gain vs. frequency for both filters from 0 to 50 rad/sec.

3) Write a C program to implement the digital filter, G(z)

FIR Filters

4) Find the impulse response of a filter with the following gain vs. frequency:

- hint: Approximate the waveform by adding up ideal low-pass filters



5) Design a FIR filter to approximate this impulse reaponse. Include in your design

- The sampling rate
- The length of the window (10 seconds?)
- The impulse response of your FIR fitler.

6) Plot the gain vs. frequency of your filter