

# ECE-210-A Assignment VII

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In this assignment, you will reinforce what we did in lecture today regarding MATLAB's filter toolbox. Please include all your work in a .m file. This assignment is due in two weeks, and has been assigned in all three sections.

For each of the following questions, generate filters using either *fdatool* or the filter design toolbox in the signal processing toolbox. Apply the filter to the signal using *filter*. Lastly, plot the Fourier Transform of the final result using *fft* and *plot*. Refer to the notes for the proper way to use *fft* and obtain the proper scaling

1. Generate a signal that consists of a sum of sine waves of frequencies 1 to 50 kHz. Set t to be from 0 to 2 seconds, using an interval of  $10\mu\text{s}$ .

$$signal = \left( \sum_{f=1}^{50000} \sin(2\pi ft) \right)$$

2. Create a Butterworth lowpass filter with a sampling frequency of  $F_s = 100$  kHz, a passband frequency of  $F_{\text{pass}} = 10$  kHz, a stopband frequency of  $F_{\text{stop}} = 20$  kHz, a passband attenuation of  $A_{\text{pass}} = 5$ dB, and a stopband attenuation of  $A_{\text{stop}} = 50$ dB.
3. Create a Chebychev I highpass filter with a sampling frequency of  $F_s = 100$  kHz, a passband frequency of  $F_{\text{pass}} = 35$  kHz, a stopband frequency of  $F_{\text{stop}} = 15$  kHz, a passband attenuation of  $A_{\text{pass}} = 2$ dB, and a stopband attenuation of  $A_{\text{stop}} = 40$ dB.
4. Create a Chebychev II bandstop filter with a sampling frequency of  $F_s = 100$  kHz, a passband frequency of below the frequency  $F_{\text{pass1}} = 5$  kHz and above  $F_{\text{pass2}} = 45$  kHz, a stopband frequency of between  $F_{\text{stop1}} = 15$  kHz  $F_{\text{stop2}} = 35$ kHz, a passband attenuation of  $A_{\text{pass}} = 5$ dB, and a stopband attenuation of  $A_{\text{stop}} = 50$ dB.
4. Create a Elliptic bandpass filter with a sampling frequency of  $F_s = 100$  kHz, a stopband frequency of below the frequency  $F_{\text{stop1}} = 15$  kHz and above  $F_{\text{stop2}} = 35$  kHz, a passband frequency of between  $F_{\text{pass1}} = 20$  kHz  $F_{\text{pass2}} = 30$  kHz, a passband attenuation of  $A_{\text{pass}} = 5$ dB, and a stopband attenuation of  $A_{\text{stop}} = 50$ dB.