ECE-210-A HW7

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Type	Type	A_{pass}	A_{stop}	Frequency specification
Butterworth	HPF	5dB	50dB	$F_{stop} = F_s/10, F_{pass} = F_s/5$
Chebyshev Type I	LPF	2dB	40dB	$F_{stop} = F_s/2, F_{pass} = F_s/4$
Chebyshev Type II	bandstop	5dB	50dB	$F_{stop} = F_s/6, fs/3, F_{pass} = F_s/12, 5F_s/12$
Elliptic	bandpass	5dB	50dB	$F_{stop} = F_s/12, 5F_s/12, F_{pass} = F_s/6, F_s/3$

For each of the above scenarios, you will generate a filter, create magnitude-phase plots for the filter, and apply the filter.

To begin with, generate a test signal x. This signal will be white noise (sample from a uniform distribution) sampled at $F_s = 100$kHz over an interval of 2 seconds. If you feel creative, you may choose an alternate signal; be sure to choose a signal with a large frequency content, and specify the sampling rate F_s in a comment.

For each filter, follow these steps. As always, use functions to avoid repeating yourself, and use subplots to organize plots.

1. Use the given specifications to produce the lowest-order filter which meets the specs. Either:
   (a) Use `filterDesigner` to generate a MATLAB function that returns a filter, and then call the function to create the filter object; or
   (b) Use the functions for designing and estimating the order of specific types of filters (e.g., `cheby2ord`, `cheby2`) to generate it without `filterDesigner`. Make sure all the parameters are correctly specified! Refer to the example from lecture.
2. Apply `freqz` on the filter object to produce a frequency-response plot. Similarly to in HW6, don't use this to plot the frequency response: manually plot the frequency response, making sure you follow all the same instructions as in HW6 #2d.
3. Apply the filter to the signal x, defined above.
4. Plot the Fourier transform of the filtered signal using `fft` and `plot`. Refer to the lecture examples for the proper way to use FFT and obtain the proper scaling (use one of the two scaling methods mentioned).