

Problem Set 1

1. A signal is sampled at 300 samples per second. Design a linear phase filter using window method. Specifications for the filter are:

$$f_p = 100 \text{ Hz}$$

$$f_s = 120 \text{ Hz}$$

$$A_p = 0.1 \text{ dB}$$

$$A_s = 50 \text{ dB}$$

Plot its frequency response (with amplitude response in dB), linear scale amplitude response, impulse response, group delay and, zeros and poles. (Hint : MATLAB functions `fir1`, `freqz`, `impz`, `grpdelay`, `zplane`). (1.5 *points*)

2. Design a linear phase FIR filter using Kaiser Window. Plot its frequency response (with amplitude response in dB), linear scale amplitude response, impulse response, group delay and, zeros and poles. (Specifications given in problem 1) (1.5 *points*)
3. Design a linear phase FIR filter using Remez algorithm. Plot its frequency response (with amplitude response in dB), linear scale amplitude response, impulse response, group delay and, zeros and poles. (specifications given in problem 1) (1.5 *points*)
4. Design an IIR Butterworth, Chebyshev 1, Chebyshev 2 and elliptic filter. Plot the frequency responses (with amplitude responses in dB), linear scale amplitude responses, impulse responses, group delays and pole/zero diagrams. (specifications given in problem 1) (0.5 *point*)