

Exercise B: Digital Filter Design

Using `sptool` of MATLAB software program, implement the following tasks. For each task, you need to prepare and send the filter coefficients (sequence of values), and filter frequency response plot (.png, .bmp, .pdf, ...). Name each file according to the number of corresponding task, and send all of them as a .zip file to the address below:

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Deadline is April 29th.

1) Design a digital FIR **lowpass** filter with the following specifications. Apply Parks-McClellan method (also known as the Equiripple, or Optimal method). Set filter order to minimum. Obtain the filter coefficients and frequency response of the designed filter.

Passband cutoff frequency: $f_p = 2 \text{ kHz}$

Stopband cutoff frequency: $f_s = 3 \text{ kHz}$

Passband ripple: $R_p = 0.25 \text{ dB}$

Stopband attenuation: $R_s = 50 \text{ dB}$

Sampling frequency: $f_s = 20 \text{ kHz}$

2) Design a digital FIR **bandpass** filter with the following specifications. Apply Parks-McClellan method (also known as the Equiripple, or Optimal method). Set filter order to minimum. Obtain the filter coefficients and frequency response of the designed filter.

Passband: $8\text{-}12 \text{ kHz}$

Stopband attenuation: $R_s = 50 \text{ dB}$

Passband ripple: $R_p = 0.001 \text{ dB}$

Transition width: 3 kHz

Sampling frequency: $f_s = 44.1 \text{ kHz}$