

Problem Set 6

1. Design a recursive filter using all-pass filters as building blocks which meets the specifications: (2 *points*)

$$\omega_p = 0.4\pi$$

$$\omega_s = 0.45\pi$$

$$R_p = 0.00019788 \text{ dB}$$

$$R_s = 43.414 \text{ dB}$$

2. Design an FIR filter that meets the following specifications:

$$\omega_p = 0.4\pi$$

$$\omega_s = 0.6\pi$$

$$\delta_p = 0.01$$

$$\delta_s = 0.001$$

Quantize the filter with different number of bits (8, 10, 12, 14, ... etc.) and different filter orders. How many bits are required to achieve the required stopband attenuation? Plot the frequency responses of the original and the quantized filters. Plot also the quantization error in each case. (3 *points*)