SEAS Winter 2020
Semester-6
Digital Signal Processing

LAB 8

Objectives:

Design an IIR filter using bilinear transformation using Butterworth and Chebyshew- Type I Filter design approximations.

Prerequisites:

- Concept of Simple digital filters and Digital IIR filter design
- Bilinear transformation
- Explore Butterworth filter design Approximation
- Explore Chebyshew Filter design Approximation

Explore Following Commands:

- **Butter**
- **lp2hp**
- **Cheby1**
- **cheb1ord**
- **freqz**
- **zplane**

Important note :

- **First design the filter with all required steps in notebook followed by MATLAB program**

Problems

1. Design the 4th Order Butterworth high pass filter having cut-off frequency 300Hz and sampling frequency 1 KHz using bilinear transformation.

You need to find Order, Cut-off frequency, Analog butterworth coefficients, Digital low pass filter Coefficients using MATLAB.   Obtain magnitude response and Pole-zero plot.

2. Design Chebyshev-I low pass filter having following specifications using Bilinear transformation with T = 0.1 s

$$0.9 \leq |H(\omega)| \leq 1, \qquad 0 \leq \omega \leq 0.35\,\pi$$
$$|H(\omega)| \leq 0.1, \qquad 0.65\,\pi \leq \omega \leq \pi$$

You need to find Analog low-pass coefficients, Analog band-pass coefficients; Digital bandpass filter Coefficients using MATLAB. Obtain frequency response and Pole-zero plot.