Tutorial #2

Ex#1 :

We want to design a digital low-pass IIR filter from a Butterworth analog filter using the bilinear transformation method. The analog filter specifications are as follows:

Sampling frequency

- Pass-band attenuation of 3dB at Ω_p where f_e = 25kHz and f_c = 2.25kHz .
- Stop-band attenuation of 10dB at $\Omega_s = 0.45\pi$.

NB: f_e is the sampling frequency and f_c is the cutoff frequency.

Ex#2 :

We wish to design a digital low-pass IIR filter from a Butterworth analog filter using the impulse invariance method. The analog filter specifications are given below:

- Pass-band attenuation of 1dB at $\Omega_p = 0.25\pi$.
- Stop-band attenuation of 10dB at $\Omega_s = 0.45\pi$.

Ex#3 :

We want to design a digital low-pass filter from an analog Chebyshev filter using the method based on impulse invariance. The analog filter specifications are as follows:

- Pass-band attenuation of 3dB at $\Omega_p = 0.2\pi$.
- Stop-band attenuation of 10dB at $\Omega_s = 0.4\pi$.

Calculate N, Ω_c and the poles where the actual part is negative as well as the transfer function of the analog and digital filter assuming that the bandwidth specifications are met.

Ex#4 :

We want to design a digital low-pass filter from an analog Chebyshev filter using the method based on bilinear transformation. The analog filter specifications are as follows:

- Pass-band attenuation of 1dB at $\Omega_p = 0.25\pi$.
- Stop-band attenuation of 10dB at $\Omega_s = 0.45\pi$.