ECE 148 **Signal Processing Applications** **Spring 2020**

Name: _____

Assignment 8: Digital Highpass Filters

Due: Tuesday, June 9

1. _____/10
2. _____/10
3. _____/10
4. _____/10
5. _____/10
6. _____/10

Total: _____/60

The objective of this homework assignment is to construct a simple procedure for the design of *digital highpass Butterworth filters*. For simplicity and consistency, we use the *bilinear transformation* method for the frequency transformation between the analog and discrete domain.

The input to your program will be the standard design specifications of the digital highpass filter, including (a) passband frequency, (b) maximum passband attenuation, (c) stopband frequency, and (d) minimum stopband attenuation.

To test your program, the specifications are:

a. *Max. passband attenuation:* $\alpha_{max} = 0.5\ dB$
b. *Passband frequency:* $\Omega_p = \pm 3\pi/4$
c. *Min. stopband attenuation:* $\alpha_{min} = 20\ dB$
d. *Stopband frequency:* $\Omega_s = \pm \pi/2$

For each of the design, your results should include:

1. steps of your design procedure,
2. parameters of the corresponding analog lowpass Butterworth filter,
3. the transfer function of the highpass digital filter *H(z),*
4. locations of the poles and zeros,
5. frequency-response plot (from $-\pi$ *to* $+\pi$, amplitude only), and
6. verification of your design by evaluating the frequency response at the passband and stopband frequencies.