Assignment 8 - IIR Filter Design

Due March 19, 1996

Please show your work. For those questions that ask you to use Matlab show the exact commands you used to compute the results.

Question 1

Consider an analog filter defined by the following transfer function:

$$H(s) = \frac{1}{s^2 + s + 1}$$

(a) What is the -3dB frequency?

(b) Assuming a sampling rate of 10 Hz, use the bilinear z-transform to find the z-transform of an IIR filter with a similar amplitude response and the same -3 dB frequency.

Question 2

Use Matlab to design a 4-th order Butterworth LP filter with -3 dB frequency of $F_s/8$. Plot the amplitude and frequency response of the filter.

Question 3

Design an 8-th order Elliptic bandpass filter with 0.5 dB maximum passband ripple, 60 dB minimum stopband attenuation and a passband from 0.5 to 22 kHz. Assume a sampling rate of 50 kHz. Plot the amplitude and frequency response of the filter.