Exercise 8

Problem 1

A digital filter has the following transfer function:

$$H(z) = \frac{(z - e^{j\frac{\pi}{4}})(z - e^{-j\frac{\pi}{4}})}{(z - 0.95e^{j\frac{\pi}{4}})(z - 0.95e^{-j\frac{\pi}{4}})}.$$

a) Sketch the magnitude response based on the positions of the poles and zeros of the filter.

b) Find an expression for $H(\omega T)$ and $\mid H(\omega T) \mid$ of the filter.

c) Sketch the magnitude response based on $H(\omega T)$.

Problem 2

A digital filter has 3 poles and 3 zeros. The zeros are placed in positions: 1 and $e^{\pm j\pi/4}$, the poles are placed at -0.9 and $0.9e^{\pm j3\pi/4}$

a) Sketch the magnitude response based on the pole- zero- diagram.

b) Find the filters $H(z)$.

c) Find an expression for the magnitude and phase response of the filter.

d) What happens to the response if we place one extra pole in origin?