Exercise 7

Problem 1

A filter has impulse response $h(n) = 5, 4, 3, 2, 1$.
The sequence $x(n) = 1, 2, 2, 0, 0, 0, 0, ...$ is used as input to the filter.

a) Find $H(z)$ for the filter.

b) Find $X(z)$ for the input sequence $x(n)$.

c) Find $Y(z)$ for the output sequence.

d) Find $y(n)$ from $Y(z)$.

Problem 2

A filter has the following difference equation:
$y(k) + 0.5y(k-1) = x(k) - x(k-1)$

a) Find the pole and zero positions for the filter. (Draw a pole-zero diagram).

c) Find an expression $H(\omega T)$ for the filter.

d) Sketch the magnitude frequency response based on the pole and zero positions.

e) Calculate the magnitude response at the frequency where $\mid H(\omega T) \mid$ has its maximum.

Problem 3

A digital filter has the following transfer function:

$$H(z) = \frac{0.1 \cdot (z^2 + 2Z + 1)}{z^2 - 1.6z + 0.89}.$$

a) Find the difference equation of the filter.

b) Draw the pole - zero diagram.