Problem Set 5

1. Design a linear phase FIR filter using Remez algorithm which meets the specifications:

$$\omega_p = 0.1\pi$$
$$\omega_s = 0.11\pi$$
$$\delta_p = 0.01$$
$$\delta_s = 0.001$$

Plot the frequency response, impulse response, groupdelay and pole-zero plot. How many calculations (multiplications and additions) per output sample are needed? (2 *points*)

2. Design the FIR filter given in problem 1 as a cascade of a periodic and nonperiodic filter:

$$H(z) = F(z^L)G(z)$$

What is the maximum value for L? Try different values for L ($L = 2, 3, 4, ...$). How many calculations (multiplications and additions) per output sample are needed in each case? Plot the frequency responses, impulse responses, pole-zero diagrams and group delays of each $F(z)$, $F(z^L)$, $G(z)$ and $H(z)$.(3 *points*)