ELEC 3004 – Systems: Signals & Controls

Tutorial 3 (Week 9): Z-transform and FIR filter design in Matlab

1. Consider discrete time FIR function

$$Y(n) = -0.001175X(n-1) - 0.028772X(n-3) - 0.176123X(n-4) + 0.084788X(n-5) + 0.5X(n-6) + 0.084788X(n-7) - 0.176123X(n-8) - 0.28772X(n-9) - 0.001752X(n-11)$$

Write the transfer function in Z domain.

Find the poles and zeros in Z domain plot them with Matlab.

With the result above analyse the stability of the filter. Check the frequency response of the filter using **`freqz`** function in Matlab.

2. FIR filter design in Matlab

Consider sampling frequency is 1000Hz and cut-off frequency is 200Hz. Design a low pass FIR filter in Matlab using fir1 command. Check the frequency response of the filter. Try increasing the order of the filter and tell the difference of the frequency response.