ELEC 4305-Computer Exercise-1

Signal Modelling

1. Write a matlab program for Pade’ and Prony’s methods of signal modelling. Given the signal values $x(n)$, for $n = 0, 1, 2, \ldots, N$, and numerator and denominators orders, $q$ and $p$, your program should be able to produce the coefficients of the numerator and denominator of the pole-zero model:

$$H(z) = \frac{B_q(z)}{A_p(z)}$$

2. Let the given sequence $x(n)$, $n = 0, 1, 2, \ldots, N$ be the impulse response of the following 3rd order system:

$$X(z) = \frac{(z - 0.2)(z - 0.4)}{(z - 0.1)(z - 0.3)(z - 0.7)}$$

3. Compare the approximations obtained by the two techniques using least-squares error:

$$J = \sum_{k=0}^{\infty} e^2(n)$$

Show also the plots of the error sequence for the two techniques.

4. Compare the approximations by varying (i) the total number of data values, $N$ and (ii) the numerator and denominator orders, $q$ and $p$.

5. Show all the necessary derivations for the two methods in your report.