Problem Set 8

EE419: Digital Communication Systems

1. Consider a WSS random process with autocorrelation function $\phi[m] = \alpha^{|m|}$, where $0 \leq \alpha \leq 1$.

   (a) Find the PSD of the process. Find the asymptotic minimum and maximum eigenvalues of the autocorrelation matrix.

   (b) Find the range of the step size resulting in convergence of the MSE gradient algorithm for order 3 for $\alpha = 0.5$. What is the range as order becomes very large?

2. What is the range of step size resulting in convergence of a MMSE-LE for Problems 2 and 3 in Problem Set 7 with $N = 3$ and $c = 0.5$? What is the range when $N \to \infty$?

3. Precisely write down the update rule of the LMS algorithm for a fractionally spaced equalizer. Consider both MMSE-LE and MMSE-DFE.