Chapter 14
Matlab Problems

14.1 Write a program to simulate an OOK system with coherent detection using the correlation receiver of Fig. 14.2-4. Plot a graph of the P_{be} versus $\log_{10}(E_b / N_o)$ ranging from 0 to 6 dB or so. Also, plot the theoretical P_{be} versus $\log_{10}(E_b / N_o)$

14.2 Repeat Prob 14.1, except use the noncoherent OOK receiver of Fig. 14.3-2. Use a match filter for the BPF. Describe your envelope detector.

14.3 Repeat Prob. 14.1 except for BPSK.

14.4 Repeat Prob. 14.1 except for an FSK system. Your coherent detector will have two separate correlators, each one matched to the 0 and 1 frequencies and will feed to a comparator.

14.5 Repeat Prob. 14.4 except use noncoherent detection and the receiver of Fig. 14.3-5.

Note the following:

a. The simulated and theoretical value of P_{be} should be plotted versus $\gamma_b = E_b / N_0$ in increments of 1 dB.
b. The binary inputs are corrupted by zero mean gaussian noise.
c. Use a uniform random number generator to generate the input sequence of logic zeros and ones. The random binary output is such that when the random number generator outputs any value less than 0.5, it is turned into a zero, and any output greater than or equal to 0.5 is turned into a one.
c. The carrier frequency should be ten times the bit rate - $f_c > 10 r_b$.
d. By varying the noise generator's variance, $\sigma^2 = N_0 / 2$, will in turn vary the signal's E_b / N_0.
e. In some cases, you might want to or have to vary the detector's threshold level in order that your simulated results closer match the theoretical ones.
f. For better performance for the noncoherent cases, consider using matched filters.