EE354 Study Guide for Exam #3

Analog Communications Performance

- Describe the fundamental properties of AWGN and how they impact the performance of an analog AM or FM receiver.
- Characterize a noise signal in terms of the time domain, frequency domain, and probability density function.
- Calculate the SNR for a sinusoidally modulated AM signal transmitted in AWGN with a given noise spectral density.
- Calculate the SNR for a sinusoidally modulated FM signal transmitted in AWGN with a given noise spectral density.

Baseband Digital Communications Performance

- Understand how M-Ary digital baseband communications maps a series of bits into a specific digital signal.
- Describe the properties of AWGN and how they impact the performance of a digital receiver.
- Calculate the SNR (E_b/N_0) of an arbitrary digital signal.
- Design a simple analog (i.e., threshold) baseband receiver for analog, discrete, or digital signals.
- Explain the assumptions/conditions under which the matched filter receiver is the ideal receiver.
- Design the matched filter for a baseband digital receiver for an arbitrary signal set.
- Compare the performance of the matched filter receiver with the threshold receiver.
- Evaluate the performance of a digital baseband receiver for an arbitrary signal set.

Amplitude Shift Keying

- Calculate the bandwidth, power, and data rate of an M-ary ASK communication system.
- Draw and label the signal constellation for an M-ASK signal set.
- Calculate the bandwidth, power, and data rate of an M-ary ASK communication system.
- Understand and describe how to demodulate ASK signals through either a coherent (i.e., Matched Filter) or incoherent (i.e., Threshold) demodulator.
- Design either an incoherent (i.e., Threshold) or ideal (i.e., Matched Filter) ASK demodulator for an M-ary signal set.
- Understand the conditions under which a threshold receiver (e.g., an envelope detector) may be used to demodulate M-ASK signals and calculate its performance.
- Calculate the SNR (E_b/N_0) for an M-ary signal set.
- Calculate the BER of an M-ary ASK communication system for various values of M.
- Compare the performance of M-ASK signaling for various values of M.
- Compare the BER performance of M-ary ASK communication systems for various values of M.

Frequency Shift Keying

- Explain how FM can be used to transmit digital signals.
- Draw and label the signal constellation for an M-FSK signal set.
- Calculate the bandwidth, power, and data rate of an M-ary FSK communication system.
- Understand the concept of Orthogonal Tone Spacing FSK, why it optimizes bandwidth usage, and calculate the bandwidth for an M-ary OTS FSK communication system.

- Understand and describe how to demodulate FSK signals through either a coherent (i.e., Matched Filter) or incoherent (i.e., Threshold) demodulator for an M-ary signal set.
- Design either an incoherent (i.e., Threshold) or ideal (i.e., Matched Filter) FSK demodulator for an M-ary signal set.
- Understand the conditions under which a threshold receiver (e.g., an envelope detector) may be used to demodulate M-FSK signals.
- Calculate the SNR (E_b/N_0) for an M-ary signal set.
- Calculate the BER of an M-ary FSK communication system for various values of M.
- Compare the performance of the M-FSK matched filter receiver with the M-ASK threshold receiver for various values of M.
- Compare the performance of M-FSK signaling for various values of M.
- Compare the BER performance of M-ary FSK communication systems for various values of M.

Phase Shift Keying

- Describe the general form of a PSK signal.
- Explain how information can be transmitted in the phase of a signal.
- Draw and label the signal constellation for an M-PSK signal set.
- Understand and describe how to create PSK signals.
- Calculate the bandwidth, power, and data rate of an M-ary PSK communication system.
- Understand and describe how to demodulate PSK signals through a coherent (i.e., Matched Filter) demodulator for an M-ary signal set.
- Design an ideal (i.e., Matched Filter) PSK demodulator for an M-ary signal set.
- Calculate the SNR (E_b/N_0) for an M-ary signal set.
- Calculate the BER of an M-ary PSK communication system for various values of M.
- Compare the performance of the M-PSK matched filter receiver with the M-ASK and M-FSK receivers for various values of M.
- Compare the performance of M-PSK signaling for various values of M.
- Compare the BER performance of M-ary PSK communication systems for various values of M.