

M.E. (ETC) 1st SEMESTER FINAL EXAMINATION, 2011

Advanced Digital Communication (ETC-929)

Time: 3 hours

Full marks: 70

Answer any FIVE questions

1. Present a mathematical model for colored noise. Develop mathematical expressions for Rayleigh and Rician distribution function for the envelope of a noise corrupted BASK signal.

Describe the method for coherent detection of BPSK and BFSK signal in presence of noise. Find out the bit error probability after coherent detection of BPSK and BFSK signal.

2. Introduce signal space concept for signal presentation. What is known as Decision Region? Describe using Decision Region concept the approach for finding probability of minimum symbol error (optimum detection) for 16-QAM signal.

3. Explain orthogonality of signal. Draw the corresponding signal space diagram. Develop an expression for probability of minimum symbol error for orthogonal signals

4. Write note on

i) Non Uniform Quantization and Companding

ii) Channel capacity for noisy channel and its relevance to Shannon's theorem.

5.

5. a) A stationary random process $X(t)$ is applied at the input of a linear time-invariant (LTI) system. Derive an expression for the power spectral density (PSD) of the output random process in terms of the PSD of $X(t)$ and frequency response of the system.

b) White gaussian noise with zero mean and PSD $N_0/2$ is applied to the filter shown in the figure below. The noise at the low pass filter output is denoted by $n(t)$. (i) Find the mean and variance of $n(t)$.

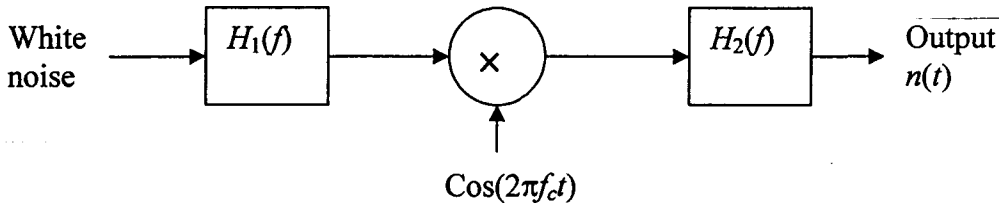


Fig. 1

$H_1(f)$ is an ideal low pass filter with bandwidth B and $H_2(f)$ is an ideal low pass filter with bandwidth B , centered around frequency f_c .

7+7

6. Draw constellation diagram of QPSK modulation scheme. Justify use of Grey encoding in QPSK modulation. Derive an expression of bit error rate in QPSK modulation scheme considering presence of additive white Gaussian Noise. 14

7. What is processing gain (PG)? Explain its importance in narrowband interference rejection in DSSS modulation. Derive necessary relation. Write down the properties of PN sequence. Write down its differences with Gold sequence. 14

8. With a neat schematic discuss transmitter and receiver architecture of an OFDM communication system. What are advantages of OFDM communication? Explain the importance of cyclic prefix (CP) in OFDM communication. Mention some applications of OFDM.