

Q.2 a. Draw and explain the block diagram of Model of a Noisy Communication System. (8)

Answer: Refer Figure 3.7, page 111 of Text Book-I

b. The input to an RC low-pass network is a zero mean stationary Gaussian random process $X(t)$ with $R_{xx}(\tau) = \exp(-\alpha|\tau|)$. Find the mean variance, and psd of the output $Y(t)$. (8)

Answer: Refer Example 3.11, page 106 of Text Book-I

Q.3 a. Explain Standard Deviation and Covariance in Statical Averages (8)

Answer: Refer Article 3.3.2, page 76 of Text Book-I

b. Derive the expression for Chebhshev's inequality for a random variable. (8)

Answer: Refer Equation 3.47, page 80 of Text Book-I

Q.4 a. Draw and explain tree diagram for Markoff source having 3 states. (10)

Answer: Refer pages 148-149 of Text Book-I

b. Explain Entropy and Information Rate of Markoff Sources. (6)

Answer: Refer Article 4.2.5, page 151 of Text Book-I

Q.5 a. Enlist the properties of Shannon's Encoding Algorithm which yields a source encoding procedure. (10)

Answer: Refer page 158 of Text Book-I

b. Explain Huffman Coding with an example. (6)

Answer: Refer Article 2.3 of Text Book-II

Q.6 a. Show that (i) $H(X|Y) = H(X)$ when X and Y are statistically independent, and (ii) $H(X|Y) = 0$ when $X = Y$. (8)

Answer: Refer Exc. Problem 4.19, page 186 of Text Book-I

b. Give one Application of the Channel Coding Theorem to Binary Symmetric Channels. (8)

Answer: Refer Article 2.7 of Text Book-II

- Q.7 a.** A Gaussian channel has a bandwidth of 4 kHz and a two-sided noise power spectral density $\eta/2$ of 10^{-4} watt/Hz. The signal power at the receiver has to be maintained at a level less than or equal to 1/10 of a milliwatt. Calculate the capacity of this channel. (8)

Answer: Refer Exc. Problem 4.24, page 187 of Text Book-I

- b.** Explain in detail Mutual Information for Continuous Ensembles. (8)

Answer: Refer Article 2.8 of Text Book-II

- Q.8 a.** Explain with block diagram Error Control coding by showing channel bit error probability and message bit error probability. (8)

Answer: Refer Figure 9.1, page 444 of Text Book-I

- b.** Design a linear block code with a minimum distance of three and a message block size of eight bits. (8)

Answer: Refer Example 9.4, page 457 of Text Book-I

- Q.9 a.** Discuss about the Algebraic Structure of Cyclic codes. (8)

Answer: Refer Article 9.3.1, page 462 of Text Book-I

- b.** Explain Maximum Likelihood Decoding of Convolutional Codes. (8)

Answer: Refer Article 8.6, page 403 of Text Book-II

TEXT BOOKS

- I. Digital and Analog Communication Systems by K. Sam Shanmugam, John Wiley India Edition, 2007 reprint
- II. Digital Communications by Simon Haykin, John Wiley & Sons, Student Edition