CBCS SCHEME

USN | | | | | | | | | | | **15EC61**

Sixth Semester B.E. Degree Examination, Aug./Sept.2020
Digital Communication

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Define Hilbert transform. State the properties of it. Mention its applications. **(05 Marks)**

b. What is line coding? For binary stream 101001 sketch the following line codes:
(i) Polar RZ (ii) Polar NRZ (iii) Bipolar NRZ (iv) Manchester **(05 Marks)**

c. Derive the expression for the complex low pass representation of band pass systems. **(06 Marks)**

OR

2 a. Derive the expression for power spectral density of Manchester format and draw the spectrum. **(06 Marks)**

b. Define pre-envelope and complex envelope of a real values signal. Given a band pass signal S(t), sketch the spectral representation of signal S(t), pre-envelope and complex envelope. **(06 Marks)**

c. Code the binary pattern (i) 1110000010110100000000010 using HDB3 and bipolar NRZ (ii) 011000011 using B3ZS. Draw B3ZS waveform. **(04 Marks)**

Module-2

3 a. Use Gram-Schmidt orthoganalization procedure and find the set of orthonormal basis functions to represent the four signals $S_1(t)$, $S_2(t)$, $S_3(t)$ and $S_4(t)$ shown in Fig.Q3(a). Also express each of these signals in terms of the set of basis functions.

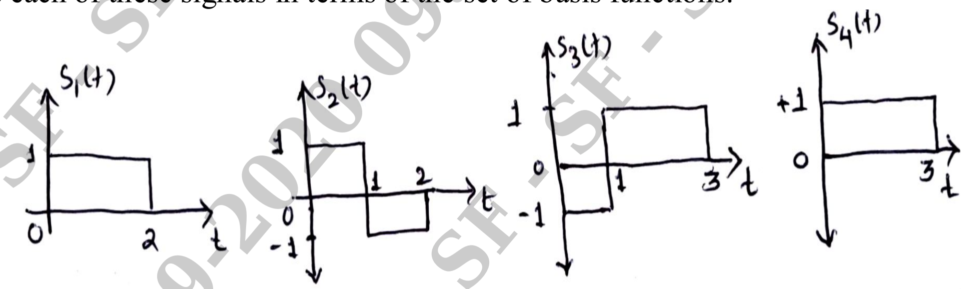

Fig.Q3(a) **(08 Marks)**

b. Explain the matched filter receiver with the relevant mathematical theory. **(08 Marks)**

OR

4 a. Explain the geometric representation of signals and express energy of the signal in terms of the signal vector. **(08 Marks)**

b. Explain the operation of correlation receiver with relevant diagrams. **(04 Marks)**

c. Explain how to convert continuous AWGN channel into a vector channel. **(04 Marks)**

Module-3

5 a. Explain the BPSK signal with its signal space characterization. With a neat block diagram, explain the generation and detection of BPSK signal. **(10 Marks)**

b. What is difference between BPSK and DPSK? Illustrate the operation of DPSK for the binary sequence 11010101. Assume reference bit as '1'. **(06 Marks)**

OR

6 a. Derive an expression for probability of error of BFSK. **(06 Marks)**

b. What is an advantage of M-ary QAM over M-ary PSK system? Obtain the constellation of QAM for M = 4 and draw the signal space diagram. **(04 Marks)**

c. With a neat diagram, explain the generation and detection of QPSK signals. **(06 Marks)**

Module-4

7 a. With a neat block diagram, explain the digital PAM transmission through band limited baseband channels and obtain the expression for ISI. **(06 Marks)**

b. State the Nyquist criterion for zero ISI. **(02 Marks)**

c. What are adaptive equalizers? Explain linear adaptive equalizer based on MSE criterion. **(08 Marks)**

OR

8 a. For the binary data sequence 11101001 given as input to the pre-coder. The output of the pre-coder is used to modulate a duo binary transmitting filter. Obtain the :
(i) Pre-coded sequence (ii) Transmitted amplitude levels
(iii) The received signal levels (iv) Decoded sequence **(04 Marks)**

b. Explain the design of band limited signals with controlled ISI. Describe the time domain and frequency domain characteristics of a duo binary signal. **(07 Marks)**

c. What is channel equalization? With a neat diagram, explain the concept of equalization using a linear transversal filter. **(05 Marks)**

Module-5

9 a. Explain the model of a spread spectrum digital communication system. **(05 Marks)**

b. With a neat block diagram, explain the CDMA system based on IS-95. **(08 Marks)**

c. Write a short note on application of spread spectrum in wireless LAN. **(03 Marks)**

OR

10 a. With a neat block diagram, explain frequency hopped spread spectrum technique. Explain the terms chip rate, jamming margin and processing gain. Also mention its applications. **(08 Marks)**

b. Explain the effect of dispreading on a narrow band interference in DSSS systems. A DSSS is designed to have the power ratio P_R/P_N at the intended receiver is 10^{-2}. If the desired $E_b/N_o = 10$ for acceptable performance, determine the minimum value of processing gain. **(04 Marks)**

c. Mention the applications of DSSS and explain any one in detail. **(04 Marks)**

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