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CBCS SCHEME

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17EC61

Sixth Semester B.E. Degree Examination, Feb./Mar. 2022
Digital Communication

Time: 3 hrs. Max. Marks: 100

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

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-1

1 a. Define Hilbert transform. List the properties of the Hilbert transform. **(06 Marks)**

b. Explain with relevant expressions, the procedure for computational analysis of a band pass system driven by a band pass signal. **(08 Marks)**

c. What is line coding? For the binary stream 011010 sketch the following line codes.
- i) Unipolar NRZ
- ii) Polar NRZ
- iii) Unipolar RZ
- iv) Bipolar RZ
- v) Manchester. **(06 Marks)**

OR

2 a. Define the pre-envelope and complex envelope of the signal. Determine the pre envelope and complex envelope of the signal shown in Fig.Q.2(a). **(06 Marks)**

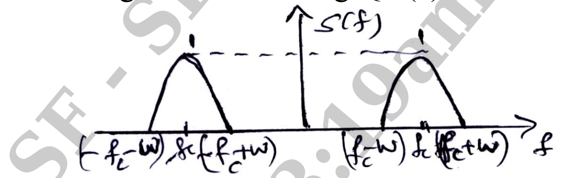

Fig.Q.2(a)

b. Obtain the canonical representation of band pass signals. **(08 Marks)**

c. What is the advantages of HDB3 code over conventional alternative mark inversion (AMI) code. Code the pattern "10100000110000011000000" using HDB3 encoding and AMI encoding. **(06 Marks)**

Module-2

3 a. Explain the Gram-Schmidt orthogonalization procedure. **(08 Marks)**

b. Derive the expression for mean and variance of the correlator outputs. Also show that the correlator outputs are statistically independent. **(06 Marks)**

c. Show that the energy of a signal equal to squared length of the signal vector. **(06 Marks)**

OR

4 a. For the signals $S_1(t)$, $S_2(t)$, $S_3(t)$ and $S_4(t)$ find a set of orthogonal basis functions using Gram Schmidt orthogonalization procedure. **(12 Marks)**

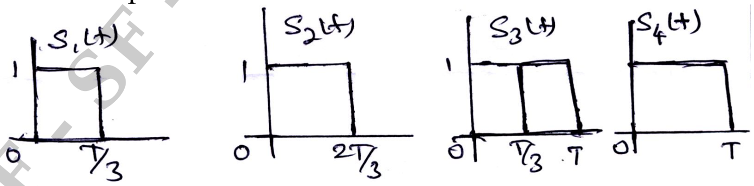

Fig.Q.4(a)

b. Explain the correlation receiver using product integrator and matched filter. **(08 Marks)**

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Module-3

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

b. Derive the expression for error probability of BFSK. **(06 Marks)**

c. Explain the generation and optimum detection of DPSK with block diagram. **(08 Marks)**

OR

6 a. What is the advantages of M-ary QAM over M-ary PSK system? Obtain the constellation of QAM for M=4 and draw signal space diagram. **(06 Marks)**

b. Derive the expression for error probability of binary PSK using coherent detection. **(08 Marks)**

c. For the binary sequence given by 10010011. Illustrate the operation of DPSK. **(06 Marks)**

Module-4

7 a. Explain the design of band limited signals with controlled ISI. **(10 Marks)**

b. Explain the modified duo-binary signaling scheme, with pre coding. Illustrate the encoding for the binary sequence 011100101. Assume previous precoder output as 1. **(06 Marks)**

c. Explain the eye pattern with diagram. **(04 Marks)**

OR

8 a. What is a zero forcing equalizer? With a neat block diagram, explain the operation of linear transversal filter. **(06 Marks)**

b. With a neat block diagram, explain the digital PAM transmission through band limited base band channel. Also obtain the expression for inter symbol-interference. **(08 Marks)**

c. With neat sketches and expressions, explain raised cosine spectrum solution to reduce ISI. **(06 Marks)**

Module-5

9 a. Explain the working of Direct sequence spread spectrum transmitter and receiver with neat diagram, waveform and expression. **(08 Marks)**

b. The direct sequence spread spectrum communication has following parameters. Data sequence bit duration T_b = 4.095ms PN chip duration T_c = 1μs $\frac{E_b}{N_o} = 10$ for average probability of error less than 10^{-5} calculate processing gain and jamming margin. **(06 Marks)**

c. Write a short note on:
i) Low detectability signal transmission
ii) Wireless LAN. **(06 Marks)**

OR

10 a. With necessary block diagram, explain the transmitter and receiver of frequency hop spread spectrum. **(08 Marks)**

b. A slow FH/MFSK system has the following parameters:
The number of bits/MFSK symbol = 4
The number of MFSK symbols per hop = 5
Calculate the processing gain of the system in decibels. **(06 Marks)**

c. What is a PN sequence? Explain the generation of maximum length sequence (ML sequence). What are the properties of ML sequence? **(06 Marks)**

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