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15EC61

Sixth Semester B.E. Degree Examination, July/August 2021 Digital Communication

Time: 3 hrs.

Max. Marks:80

Note: Answer any FIVE full questions.

- 1
 - a. Define the pre-envelope. Show the spectral representation of pre-envelopes for low pass signal. (06 Marks)
 - b. Define Hilbert transform. State and prove its properties. (06 Marks)
 - c. For the binary data 10011101, sketch the following :
 - i) RZ unipolar
 - ii) NRZ polar
 - iii) NRZ Bipolar
 - iv) Manchester format. (04 Marks)

- 2
 - a. Derive the expression for power spectral density of polar signaling. (08 Marks)
 - b. Derive the expression for complex low pass representation of band pass system. (08 Marks)

- 3
 - a. Explain the geometric representation of the signal for $N = 2$ and $M = 3$ and explain the various parameters. (06 Marks)
 - b. S.T. correlator outputs are statically independent. (04 Marks)
 - c. What do you mean by match filter receiver? Derive the expression for the impulse response of matched filter receiver. (06 Marks)

- 4
 - a. Using Gram-Schmitt orthogonalization procedure and find the orthonormal basis function for the signal shown below.

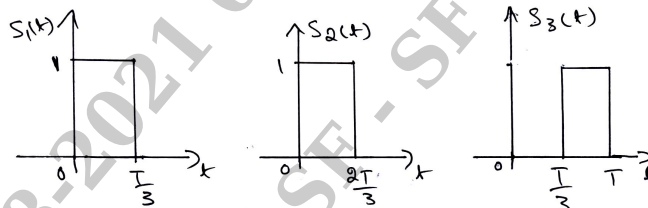


Fig.Q4(a) (08 Marks)

- b. With neat block diagram explain detector and maximum likelihood decoder of a correlation receiver. (08 Marks)

- 5
 - a. Explain the generation and detection of BFSK. (06 Marks)
 - b. With the signal space representation of BPSK derive the expression for probability of error. (06 Marks)
 - c. For the input binary sequence 11001001, draw the in phase and quadrature phase components of the QPSK signal. (04 Marks)

- 6
 - a. With a neat block diagram, explain the generation and coherent detection of QPSK signal. (06 Marks)
 - b. Explain the DPSK transmitter and receiver with neat block diagram. (06 Marks)
 - c. Explain the binary FSK using non coherent detection. (04 Marks)

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.



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- 7 a. With a neat diagram of digital PAM system obtain the expression for ISI. (10 Marks)
b. State and prove Nyquist criterion for zero ISI. (06 Marks)
- 8 a. Explain the design by band limited signals with controlled ISI. (10 Marks)
b. With neat diagram and relevant expressions explain the concept of adaptive equalization. (06 Marks)
- 9 a. Explain the model of a spread spectrum digital communication system. (08 Marks)
b. A slow frequency Hopped/MFSK system has the following parameters
i) The number of bits/MFSK symbol = 4
ii) The number of MFSK symbol per hop = 5
iii) Calculate the processing gain of the system in decibels. (02 Marks)
c. List and briefly explain any 3 application of direct sequence spread spectrum. (06 Marks)
- 10 a. With a neat block diagram explain frequency spread spectrum technique. Also explain the terms chip rate, jamming margin and processing gain. (08 Marks)
b. Explain the effect of despreading on a narrow band interference in direct sequence spread spectrum systems.
A DSSS signal is designed to have the power ratio P_R/P_N at the intended receiver is 10^{-2} . If the desired $E_b/N_0 = 10$ for acceptable performance. Determine the minimum value of processing gain. (08 Marks)

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