CBCS Scheme

USN | | | | | | | | | | |

15EC61

Sixth Semester B.E. Degree Examination, June/July 2018

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. List the properties of the Hilbert transform. **(04 Marks)**

b. Obtain the canonical representation of band pass signals. **(06 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 pre-envelope of a real valued signal. Given a band pass signal s(t), sketch the amplitude spectra of signal s(t), pre-envelope $s_+(t)$ and complex envelope $\tilde{s}(t)$. **(04 Marks)**

b. Derive the expression for the complex low pass representation of band pass systems. **(08 Marks)**

c. Write a note on HDBN signaling. **(04 Marks)**

Module-2

3 a. Explain the geometric representation of signals. Show that energy of the signal is equal to the squared length of the vector representing it. **(08 Marks)**

b. Derive the expressions for mean and variance of the correlator outputs. Also show that the correlator outputs are statistically independent. **(08 Marks)**

OR

4 a. Explain the Gram-Schmidt orthogonalization procedure. **(06 Marks)**

b. Obtain the maximum likelihood decision rule for the signal detection problem. **(10 Marks)**

Module-3

5 a. Explain the signal space representation for binary phase shift keying modulation. Also derive the expression for the probability of error for the binary phase shift keying. **(10 Marks)**

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

OR

6 a. With a neat block diagram, explain the non-coherent detection of binary frequency shift keying technique. **(04 Marks)**

b. Derive an expression for probability of error of binary frequency shift keying technique. Also draw the block diagrams of BFSK transmitter and coherent receiver. **(10 Marks)**

c. For the binary sequence given by 10010011, illustrate the operation of DPSK. **(02 Marks)**

Module-4

7 a. With a neat block diagram of digital PAM system obtain the expression for inter symbol interference (ISI). **(06 Marks)**

b. State and prove Nyquist condition for zero ISI. **(06 Marks)**

c. For the binary data sequence $\{d_n\}$ given by 11101001. Determine the precoded sequence, transmitted sequence, received sequence and the decoded sequence. **(04 Marks)**

OR

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

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

Module-5

9 a. Explain the model of a spread spectrum digital communication system. **(06 Marks)**

b. Explain the generation and demodulation of direct sequence spread spectrum signals with necessary equation and block diagram. **(07 Marks)**

c. Write a note on low detectability signal transmission as an application of direct sequence spread spectrum. **(03 Marks)**

OR

10 a. With a neat block diagram, explain the frequency hopped spread spectrum. **(07 Marks)**

b. Explain the effect of despreading on a Narrow band interference in direct sequence spread spectrum systems. A direct sequence spread spectrum signal is designed to have the power ratio P_R/P_N at the intended receiver is 10^{-2}. If the desired $E_b/N_o = 10$ for acceptable performance, determine the minimum value of processing gain. **(06 Marks)**

c. Write a note on code division multiple access as an application of direct sequence spread spectrum. **(03 Marks)**

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