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 symbo 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 linea transversal filter. (06 Marks

Module-5

9 a. Explain the model of a spread spectrum digital communication system. (06 Mark

b. Explain the generation and demodulation of direct sequence spread spectrum signals wit necessary equation and block diagram. (07 Mark

c. Write a note on low detectability signal transmission as an application of direct sequenc spread spectrum. (03 Mark

OR

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

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

c. Write a note on code division multiple access as an application of direct sequence spre spectrum. (03 Mark

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