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Paper Id: | 131279 |

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Roll No. | | | | | | | | | | | |

B.TECH.
(SEM VI) THEORY EXAMINATION 2018-19
DIGITAL COMMUNICATION

Time: 3 Hours   *Total Marks: 100*

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1.   **Attempt *all* questions in brief.**   **2 x 10 = 20**

(a)   What are the main elements of digital communication system?

(b)   Define the term OFDM?

(c)   Write a short note on random process?

(d)   Define mean and variance for random variable?

(e)   What do you understand by matched filter?

(f)   What is the expression for error probability of ASK using matched filter detection?

(g)   What is PN sequence?

(h)   Explain the term processing gain of spread spectrum system?

(i)   What is discrete Memoryless Channels?

(j)   A source is emitting 4 equiprobable symbols. Construct a Huffman code for source?

SECTION B

2.   **Attempt any *three* of the following:**   **10x3=30**

(a)   Explain with the help of neat diagram, the method for Generation and Demodulation of DPSK.

(b)   The probability density function is given as $f_x(x) = ae^{-b|x|}$, where X is a random variable whose allowable values range from $x = -\infty$ to $x = +\infty$. Find
(i) Relationship between a and b.
(ii) CDF.

(c)   Explain the block diagram of optimum receiver for binary coded signal and drive the expression for probability of error (Pe) for optimum filter receiver.

(d)   Explain frequency hopping spread spectrum with FSK modulation with the help of transmitter and receivers.

(e)   Write a note on (I) Source code theorem (II) Kraft-inequality?

SECTION C

3.   **Attempt any *one* part of the following:**   **10X1=10**

(a)   Represent the data 10110100 using the following digital data formats with the help of neat figures- (i) Unipolar RZ (ii) Unipolar NRZ (iii) split phase Manchester (iv) AMI RZ

(b)   What do you mean by Inter Symbol Interference (ISI) &Explain the Generation and Detection of FSK with neat diagram.

4. **Attempt any *one* part of the following:**   10X1=10

(a)   What is PN sequence? Draw suitable PN sequence generator and prove the properties of PN sequence and sketch its autocorrelation function.

(b)   With the help of block diagram and suitable expression explain the generation and reception of direct sequence spread spectrum (DS-SS).

5. **Attempt any *one* part of the following:**   10X1=10

(a)   State and prove central limit theorem.

(b)   Explain variance and standard deviation of a random variable? Derive the relationship between CDF and PDF?

6. **Attempt any *one* part of the following:**   10X1=10

(a)   Derive an expression for the probability of error of the binary phase shift keying (BPSK) signal?

(b)   Derive an expression for error probability of a matched filter.

7. **Attempt any *one* part of the following:**   10X1=10

(a)   The parity check matrix of a particular (7,4) linear block code is given by:

$$[H] = \begin{bmatrix} 1 & 0 & 1 & 1 & : & 1 & 0 & 0 \\ 1 & 1 & 0 & 1 & : & 0 & 1 & 0 \\ 0 & 1 & 1 & 1 & : & 0 & 0 & 1 \end{bmatrix}$$

   (i) Find the generator matrix (G).

   (ii) List all the code vectors.

   (iii) What is the minimum distance between code vectors?

   (iv) How many errors can be detected and corrected?

(b)   For a (7,4) cyclic code, the generating polynomial $g(x)=1+x+x^3$. Find the code word if data word is (i) 0011 and (ii) 0100. What is soft and hard decision decoding?

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