**B.Tech Odd Semester (CBCS) Exam., December—2016**

ELECTRONICS AND TELECOMMUNICATION ENGINEERING

**( 5th Semester )**

Course No. : ETC–501

**( Digital Communication )**

*Full Marks* : 75
*Pass Marks* : 30

*Time* : 3 hours

*Note* : 1. Attempt **five** questions, selecting **one** from each Unit.
2. Begin each answer in a new page.
3. Answer parts of a question at a place.
4. Assume reasonable data wherever required.
5. The figures in the margin indicate full marks for the questions.

UNIT—I

**1.** Describe the process of sampling and how the message signal is reconstructed from its samples. Also illustrate the effect of aliasing with neat sketch. 12+3=15





**2.** *(a)* Draw the basic block diagram of digital communication system. State the role of each component. 8

*(b)* Discuss the advantages of digital communication over analog communication. 5

*(c)* Define joint probability density function (Joint PDF). 2

UNIT—II

**3.** *(a)* What is quantization error? Derive an expression for quantization error. 5

*(b)* A message signal $m(t)$ $4\cos 2\ 10^3 t$ is sampled at Nyquist rate and is transmitted through a channel using 3-bit PCM system.

*(i)* Calculate all parameters of PCM.

*(ii)* If the sample values are 3·8, 2·1, 0·5, –2·7, –3·2, –4, determine the quantizer output, encoder output and quantization error.

*(iii)* Sketch the transfer character of quantizer. 3+3+2=8

*(c)* List the advantages of delta modulation over PCM. 2

**4.** *(a)* Explain delta modulation in detail with suitable diagram. Also explain ADM and compare its performance with DM. 4+4=8

*(b)* What is the necessity of non-uniform quantization? 2

*(c)* A delta modulator system is designed to operate at five times the Nyquist rate for a signal having a bandwidth equal to 3 kHz bandwidth. Calculate the maximum amplitude of a 2 kHz input sinusoidal signal for which the delta modulator does not have slope overload. Given that the quantizing step size is 250 mV. Also, derive the formula that you use. 5

UNIT—III

**5.** *(a)* Explain the principle of binary phase shift keying (BPSK). 5

*(b)* Expalin the generation and detection of coherent BFSK scheme with proper diagram. 8

*(c)* Explain the concept of non-coherent binary amplitude shift keying (ASK). 2





**6.** *(a)* Explain the generation and detection of DPSK with proper diagram. 10

*(b)* What is QPSK? Draw the constellation diagram for 4 QAM and 8 QAM. 5

UNIT—IV

**7.** *(a)* What is the significance of spread spectrum modulation techniques? 5

*(b)* With the help of block diagram, explain DS-SS transmitter and receiver for binary PSK? 8

*(c)* Write the expression for bit error rate (BER) for DS-SS system. 2

**8.** *(a)* What is pesudonoise sequence? How is it generated? 5

*(b)* What is frequency hopping? Explain how frequency signals are generated. 7

*(c)* Derive the expression for BER in FH-SS system. 3

UNIT—V

**9.** *(a)* What is entropy? Explain. 5

*(b)* What is information rate? 2

*(c)* A discrete memoryless source (DMS) $X$ has four symbols $x_1$, $x_2$, $x_3$ and $x_4$ with probabilities $P(x_1)$ 0 4, $P(x_2)$ 0 3, $P(x_3)$ 0 2 and $P(x_4)$ 0 1.

*(i)* Calculate $H(X)$.

*(ii)* Find the amount of information contained in the message $x_1x_2$, $x_1x_3$ and $x_4x_3x_3x_2$, and compare with the $H(X)$ obtained in part *(i)*. 5

*(d)* What is a discrete memoryless channel (DMC)? Explain. 3

**10.** *(a)* A DMS $X$ has five symbols $x_1$, $x_2$, $x_3$, $x_4$ and $x_5$ with $P(x_1)$ 0 2, $P(x_2)$ 0 15, $P(x_3)$ 0 05, $P(x_4)$ 0 1 and $P(x_5)$ 0 5.

*(i)* Construct a Shannon-Fano code for $X$, and calculate the code efficiency.

*(ii)* Repeat *(i)* for the Huffman code. 10

*(b)* Explain the Shannon-Fano algorithm. 5

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