

6E6054**6E6054**

B.Tech. VI Semester (Main & Back) Examination, April/May-2017
Electronics & Communication Engg.
6EC4A Digital Communication

Time : 3 Hours

Maximum Marks : 80
Min. Passing Marks : 26

Instructions to Candidates:

Attempt any five questions, selecting one question from each unit. All Questions carry equal marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitable be assumed and stated clearly). Units of quantities used/calculated must be stated clearly.

Unit-I

1. a) Explain the technique which is required to convert the analog signal to digital signal with proper block diagram. (8)
- b) In a single integration Delta Modulation system, the voice signal is sampled at rate of 64 KHz. The maximum signal amplitude $A_{max} = 1$.
- Determine the minimum value of the step size σ to avoid slope overload.
 - Determine the granular noise power N_0 if the voice signal bandwidth is 3.5 KHz.
 - Assuming that the voice signal is sinusoidal, determine S_0 and SNR.
 - Assuming that the voice signal amplitude is uniformly distributed in the range $(-1, 1)$, determine S_0 and the SNR.
- (2×4)

OR

1. a) What is meant by slope overload distortion and granular noise in Delta modulation system? How it can be avoided? (4+4)
- b) Write short note on T1 carrier system. (8)

Unit-II

2. a) Consider the binary sequence 0100101, draw the waveforms for the following formats. (2×4)
- Bipolar RZ
 - Unipolar NRZ
 - AMI RZ
 - Manchester
- b) A binary PCM wave is to be transmitted over a low pass channel with an absolute maximum bandwidth of 75 KHz. The bit duration is 10 micro seconds. Find a raised cosine spectrum that satisfies these requirements. (8)

OR

2. a) Derive the Nyquist's criterion for distortion less base band binary transmission in the absence of noise. (8)
- b) Describe the detection process of matched filter and its applications with suitable diagram. (8)

Unit-III

3. a) Explain and compare the BPSK and QPSK modulation techniques w.r.t. bandwidth requirement, probability of error and data rate and their advantages and disadvantages also. (4+4)
- b) Explain the selection criteria for digital modulation techniques and applications for different modulation techniques. (8)

OR

3. a) Draw the signal space diagram for coherent binary PSK system. Derive the average probability of symbol error for coherent BPSK. (4+4)
- b) What do you mean by union bound approximation? Explain with suitable diagram and justification. (4+4)

Unit-IV

4. a) For a continuous random variable x constrained to a peak magnitude M ($-M < x < M$). Show that the entropy is maximize when x is uniformly distributed in the range of $(-M, M)$ and has zero probability density outside the range. Show that the maximum entropy is given by "log 2M". (8)
- b) State and explain the Shannon's channel capacity theorem and its bound. (6+2)

OR

4. a) A television picture is composed of approximately 3,00,000 basic pixels. Each of these elements can assume 10 distinguishable brightness levels with equal probability. Find the information content of a television picture frame. (8)
- b) For a noiseless channel, prove that $H(X/Y) = 0$. (8)

Unit-V

5. a) A source emits six messages with probabilities $1/2, 1/4, 1/8, 1/16, 1/32, 1/32$ respectively find the entropy of the source. Obtain the compact binary code and find the average length of the code word. Determine the redundancy and efficiency of the code. (4+4)
- b) Describe performance comparison of coded and uncoded system. (4+4)

OR

5. a) A DMS has an alphabet of eight letters $x_i, i = 1, 2, 3 \dots 8$ with probabilities 0.25, 0.20, 0.15, 0.12, 0.10, 0.08, 0.05 and 0.05.
- i) Use the Huffman encoding procedure to determine a binary code for the source output.
- ii) Determine the average number \bar{R} of binary digits per source letter.
- iii) Determine the entropy of the source and compare it with \bar{R} . (4+2+2)
- b) For (7,4) cyclic code and $G(x) = 1 + X^2 + X^3$ Determine : (4+4)
- i) Let data word 1010 find corresponding code word.
- ii) Code word is 100101-find data word.