

6E6054

Roll No. _____

Total No of Pages: **4****6E6054****B. Tech. VI-Sem. (Main/Back) Exam., April/May-2016
Electronics & Communication Engineering
6EC4A Digital Communication****Time: 3 Hours****Maximum Marks: 80****Min. Passing Marks (Main & Back): 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 may suitably be assumed and stated clearly. rtuonline.com

Units of quantities used/ calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL _____2. NIL _____**UNIT-I**

- Q.1 (a) Explain the quantization error and derive an expression for maximum signal to noise ratio in PCM system that uses linear quantization. rtuonline.com [8]
- (b) A television signal having a bandwidth of 4.2 MHz is transmitted using a binary PCM system. Given that the number of quantization level is 512, determine- [8]
- Code Word Length
 - Transmission Bandwidth
 - Final Bit Rate
 - Output Signal to Quantization Noise Ratio

OR

- Q.1 (a) What are the drawbacks of Delta Modulation and how it is removed in ADM? [8]
- (b) In a DM system, the voice signal is sampled at a rate of 64,000 samples/ second. The maximum signal amplitude $A_{\max} = 1$
- (i) Determine minimum value of step size to avoid slope overload [2]
- (ii) Determine quantization noise power if voice signal bandwidth is 3.5 kHz. [3]
- (iii) Assuming voice signal to be a sine wave, determine S_0 and the SNR [3]

UNIT-II

- Q.2 (a) Explain Inter – Symbol Interference (ISI) in detail. [8]
- (b) Given that the bit sequence given below is to be transmitted - [4×2=8]
- Bit sequence = 10110010
- Draw the resulting waveform, if the sequence is transmitted using -
- (i) Unipolar RZ & NRZ
- (ii) Bipolar RZ & NRZ
- (iii) Polar RZ & NRZ
- (iv) AMI & M – array when $M = 4$

OR

- Q.2 (a) Explain the Nyquist criterion for distortion less baseband binary transmission. [8]
- (b) Explain the following formats with equation (assume suitable data for diagram). [4×2=8]
- (i) Unipolar RZ & NRZ
- (ii) Bipolar RZ & NRZ
- (iii) Manchester format
- (iv) Polar Quaternary NRZ format

UNIT-III

- Q.3 (a) Explain MSK transmitter and receiver. What are the advantages of MSK as compared to QPSK? [10]
- (b) In a digital continuous time communication system, the bit rate of NRZ data stream is 1Mbps and carrier frequency of transmission is 100 MHz. Find the symbol rate of transmission and bandwidth requirement of the channel in following cases of different techniques used : [3×2=6]
- (a) BPSK system
- (b) QPSK system
- (c) 16 ary PSK system

OR

- Q.3 (a) Explain M – ary and PSK in Detail. [12]
- (b) For the following data stream, show the phase states of carrier and draw QPSK Signal Data stream = 10110001 [4]

UNIT-IV

- Q.4 (a) Explain entropy and prove the following: [8]
- $$0 \leq H(X) \leq \log_2 m, \text{ where } m \text{ is the size of the alphabet in } X$$
- (b) Given a telegraph source having two symbols, dot and dash. The dot duration is 0.2 second. The dash duration is three times the dot duration. The probability of the dots occurring is twice that of the dash and the time between symbols is 0.2 second.
- Calculate the information rate of telegraph source. [8]

OR

Q.4 (a) A discrete memory less source (DMS) X has four symbols x_1 x_2 x_3 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 $H(X)$ [4]

(ii) Find the amount of information contained in the message x_1 x_2 x_1 x_3 and x_4 x_3 x_2 x_3 [4]

(b) Explain channel capacity and prove $C = B \log_2 \left(1 + \frac{S}{N} \right)$ [8]

UNIT-V

Q.5 Write short notes on: (Any Four) [4×4=16]

- (a) Hamming code
- (b) Signal parity bit code
- (c) Linear block code
- (d) Cyclic code
- (e) Convolutional code

OR

Q.5 A DMS has seven symbols x_1 x_2 x_3 x_4 x_5 x_6 x_7 with probabilities $P(x_1) = 0.05$, $P(x_2) = 0.05$, $P(x_3) = 0.1$, $P(x_4) = 0.15$, $P(x_5) = 0.3$, $P(x_6) = 0.2$ and $P(x_7) = 0.15$. [2×8=16]

- (a) Construct a Shannon fano code for X, and calculate the efficiency of code
- (b) Repeat for the Huffman code and compare the result