

6E6054

B. Tech. VI-Sem. (Main / Back) Exam., October 2020
Electronics & Communication Engineering
6EC4A Digital Communication

Time: 2 Hours

Maximum Marks: 48

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Min. Passing Marks: 16

Instructions to Candidates:

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

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

1. NIL2. NIL**UNIT-I**

- Q.1 (a) What is meant by Quantization? Explain the need of quantization of signals and derive an expression for Quantization error. [10]
- (b) An audio signal, $s(t) = 3\cos(2\pi 500 t)$ is Quantized using 10-bit PCM. Determine the signal-to-Quantization noise ratio. [6]

OR

- Q.1 (a) With neat diagram, explain the adaptive delta modulation and demodulation system in detail. [8]
- (b) Compute the Signal-to-Noise Power Ratio (SNR) for PCM and DM system for specified probability of error (P_e) as 10^{-6} . Assume $n = 8$ in a code word. Comment on the result. [8]

UNIT- II

- Q.2 (a) Give the classification hierarchy of line encoding techniques. Discuss the comparative advantages and disadvantages of unipolar NRZ, bipolar RZ, and bipolar AMI-RZ signaling line code formats. [8]
- (b) Plot the output waveform of a baseband quaternary PAM system for the input binary data sequence 0010110111. [8]

OR

- Q.2 (a) A matched filter has the frequency response- [10]

$$H(f) = \frac{1 - e^{-j2\pi f}}{j2\pi f}$$

- (i) Determine the impulse response $h(t)$.
- (ii) Determine the signal waveform to which the filter characteristics are matched.
- (b) Discuss the effects of Inter Symbol Interference (ISI) on the performance of digital transmission. [6]

UNIT- III

- Q.3 (a) Draw the signal constellation of a binary FSK modulation scheme. Draw the block diagrams of generation and detection of coherent binary FSK signals. [10]
- (b) In a BPSK digital communication system, the bit rate of a bipolar NRZ data sequence is 1 Mbps and carrier frequency of transmission is 100MHz. Determine the symbol rate of transmission and the bandwidth requirement of the communication channel. [6]

OR

- Q.3 (a) Derive the relation for the average probability of symbol error for coherent M-ary PSK. [8]
- (b) Explain the difference between coherent and non-coherent detection. Also sketch the signal constellation of a QPSK modulator. [8]

UNIT- IV

- Q.4 (a) State and explain Shannon-Hartley theorem on channel capacity and its implications. [8]
- (b) Consider a telegraph source having two symbols, dot and dash. The dot duration is 0.2s. The dash duration is 3 times the dot duration. The probability of the dot's occurring is twice that of the dash, and the time between symbol is 0.2s. Calculate the information rate of the telegraph source. [8]

OR

- Q.4 (a) Describe trade-off between SNR and bandwidth of a channel capacity (expressed in bits per seconds) is maintained constant. [8]
- (b) A DMS has five symbols x_1, x_2, x_3, x_4 and x_5 with $P(x_1) = 0.4, P(x_2) = 0.19, P(x_3) = 0.16, P(x_4) = 0.15$, and $P(x_5) = 0.1$. [8]
- (i) Construct a Shannon-Fano code for x , and calculate the efficiency of the code.
- (ii) Repeat for the Huffman code and compare the results.

UNIT- V

Q.5 (a) What are Hamming codes? How many errors can be detected and corrected with the help of these codes? Explain with example. [8]

(b) A parity-check code has the parity-check matrix- [8]

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

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- (i) Determine the generator matrix G.
- (ii) Find the code word that begins 101....
- (iii) Suppose that the received word is 110110.

Decode this received word.

OR

Q.5 (a) Discuss the error detecting and error correcting capabilities of convolution codes. [8]

(b) Let C be a (7, 4) cyclic code with $g(x) = 1 + x + x^3$. Find a generator matrix G for C and find the code word for $d = (1 \ 0 \ 1 \ 0)$. [8]