Code No: R1931043 **R19** **SET - 1**

III B. Tech I Semester Regular Examinations, February-2022

DIGITAL COMMUNICATIONS

(Electronics and Communication Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions **ONE** Question from **Each unit**
All Questions Carry Equal Marks
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UNIT-I

1. a) Draw the block diagram of PCM system and explain the function of each block. [8M]
   b) A signal is obtained by the multiplication of $x_1(t) = A_1 \sin(\omega_o t)$ and $x_2(t) = A_2 \cos(\omega_o t)$. The resulting signal is to be sent by delta modulation method. Find the minimum step size required to avoid slope overload distortion. [7M]

(OR)

2. a) Draw the block diagram of closed-loop DPCM system and explain its operation. [8M]
   b) Explain slope-overload noise and granular noise. [7M]

UNIT-II

3. a) What is the phase ambiguity problem of BPSK scheme? How is it overcome? [8M]
   b) Sketch the constellation of QPSK scheme. Illustrate the effect of the attenuation on the constellation at the receiver. [7M]

(OR)

4. a) Distinguish between DPSK and DEPSK modulation schemes. [8M]
   b) Draw the power spectral density of BASK, BPSK and BFSK signals. [7M]

UNIT-III

5. a) When the input noise is white, show that the impulse response of matched filter is $h(t) = K\, s(t_o - t)$, where K is a positive real constant and $s(t)$ is the input signal. [8M]
   b) Explain the operation of non-coherent FSK receiver. [7M]

(OR)

6. a) Derive an expression for probability of error of BPSK modulation scheme. [8M]
   b) Explain the working of coherent PSK receiver. [7M]

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UNIT-IV

7. a) A source has an alphabet $\{A, B, C, D\}$ with corresponding probabilities $\{0.1, 0.2, 0.3, p\}$ $with$ $0 \leq p \leq 1$. Design a Huffman code for the source and compare the average length of the Huffman code with the entropy of the source. [8M]

   b) Explain how the Huffman algorithm is used to devise the source code. [7M]

(OR)

8. a) A message source generates one of four independent messages randomly every second. The probabilities of these messages are 0.35, 0.3, 0.25 and 0.1. Find the source entropy and develop Shannon-Fano code. [8M]

   b) Give the statement of Shannon-Hartley theorem. Find the channel capacity if [7M]

   (i) bandwidth = 10 MHz, average transmitted power = 5 W and $N_0 = 20\ \mu W/Hz$

   (ii) bandwidth = 100 MHz, average transmitted power = 1 kW and $N_0 = 10\ \mu W/Hz$

   Comment on the answers that obtained in (i) and (ii).

UNIT-V

9. a) What are the steps in Viterbi decoding algorithm? Explain. [8M]

   b) The parity check matrix of a (6, 3) LBC is given by [7M]

$$H^T = \begin{bmatrix} 1 & 0 & 0 & 1 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 1 & 1 & 0 \end{bmatrix}.$$ Find the generator matrix.

(OR)

10. a) Show that the (3, 1) repetition code is a Hamming code. Also find d_{min}. Verify that it is a single error correcting code or not. [8M]

    b) Consider a rate ½ convolutional encoder of your choice and give its trellis diagram description. [7M]

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