Code No: R2031043 **R20** SET - 1

III B. Tech I Semester Supplementary Examinations, May/June -2024
DIGITAL COMMUNICATIONS
(Electronics and Communication Engineering)

Time: 3 hours Max. Marks: 70

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

1. a) Derive the expression for signal to quantization noise ratio in a DM system. [7M]
   b) A sinusoidal signal of 2 kHz frequency is applied to a delta modulator. The sampling rate and step-size Δ of the delta modulator are 20,000 samples per second and 0.1 V, respectively. To prevent slope overload, what is the maximum amplitude of the sinusoidal signal (in Volts). [7M]

(OR)

2. a) Explain the desirable properties of line codes. What is essential bandwidth? [7M]
   b) In a PCM system, the signal m(t) = {sin (100πt) + cos(100πt)} V is sampled at the Nyquist rate. The samples are processed by a uniform quan□zer with step size 0.75 V. Find the minimum data rate of the PCM system in bits per second. [7M]

UNIT-II

3. a) Outline the generation and detection of a coherent ASK signal and derive the power spectral density of binary ASK signal and plot it [7M]
   b) Compare binary and M-ary signalling schemes. [7M]

(OR)

4. a) Explain QPSK with waveforms, constellation diagram and mathematical representation. [7M]
   b) Compare BASK, BFSK, BPSK and QPSK. [7M]

UNIT-III

5. a) What are the properties of Matched filter? [7M]
   b) Find out the Probability of error BASK. [7M]

(OR)

6. a) Obtain the optimum filter transfer function. [7M]
   b) A BPSK system makes errors at the average rate of 100 errors per day. Data rate is 1 Kbps. The single-sided noise power spectral density is 10 W/Hz. Assume the system to be wide sense stationary, what is the average bit error probability? [7M]

UNIT-IV

7. a) State and prove properties of mutual information. [7M]
   b) A Memory less source emits six messages with probabilities {0.4, 0.2, 0.2, 0.1, 0.1}. Find the Shannon - Fano code and determine its efficiency [7M]

(OR)

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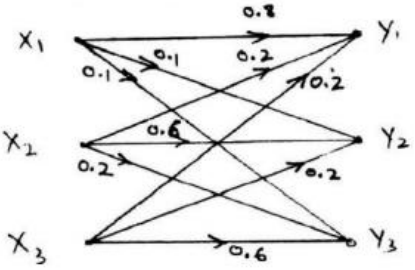
8. a) Consider that two sources emit messages xl , x2, x3 and y1, y2, y3 with the joint probabilities p (X, Y) as shown in the matrix form: [7M]



(i) Calculate the entropies of X and Y. (ii) Calculate the joint and conditional entropies, H (X,Y), H (X/Y), H(Y/X) between X and Y (iii) Calculate the average mutual information I(X;Y).

b) Discuss the trade off between bandwidth and SNR. [7M]

UNIT-V

9. a) Consider a (6,3) linear block code whose generator matrix is given by [7M]

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

(i) Find the parity check matrix. (ii) Find the minimum distance of the code. (iii) Draw the encoder and syndrome computation circuit.

b) Compare between code tree and trellis diagram. [7M]

(OR)

10. a) Explain Viterbi algorithm to decode a convolutionally coded message. [7M]

b) Discuss the matrix discription of Linear Block codes. [7M]