TE|ETRX|V (R) 1|6|13

DCCT

V-A4-1st-Hf-Ex-13-E-80

Con. 9705-13. **GS-9228**

(3 Hours) **[Total Marks : 100**

N.B. : (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** questions out of remaining **six** questions.
(3) Assume any **suitable** data wherever **required** but **justify** the **same**.

1. Attempt any **four** from the following :— **20**
   (a) Justify : Phase continuity is maintained in MSK-Signal.
   (b) Justify : In DEPSK transmissioin, error always exists in pairs.
   (c) A 3 digit message is transmitted over a noisy channel having a probability of error P_e = (215) Per digit. Determine probability of errorless message and plot all possible probability of occurance of error.
   (d) Differentiate between Systematic and Non-Systematic Cyclic code with suitable examples.
   (e) Explain with Neat Eye diagram, how intersymbol interference can be analyse.

2. (a) A discrete memoryless source has in alphabet of fine Symbol with there probabilities an shown : **10**

Symbol	S_1	S_2	S_3	S_4	S_5
Probability	0·15	0·11	0·19	0·40	0·15

   (i) Construct Huffman code and calculate code efficiency and redundancy of the code.
   (ii) Repeat the same for Shannon-fana code and compare the result.
   (b) Does Rayleigh distribution consider two signal components, each having Gaussian distribution ? **5**
   (c) How are error function erf(u) and Complementary error funciton $erf_c(u)$ related ? **5**

3. (a) Prove with suitable power spectral density curve, the bandwidth of QPSK system is one half the bandwidth of BPSK system. **10**
   (b) Draw the phasor digram of 8-ary PSK and calculate the minimum distance between two symbol. **6**
   (c) Compare Orthogonal and Non-orthogonal FSK. **4**

4. (a) The Parity check matrix $\overline{H}$ of a linear (7, 4) block code is given as follows :— **10**

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

Show how data words (i) 0011 (ii) 0100 and (iii) 0110 are coded. Also show how error is detected when 2nd bit is detected erroneously for data word 0011.

[TURN OVER

(b) A (7, 4) cyclic code is generated using the Polynomial $x^3 + x + 1$ **10**
   (i) Generate the systematic cyclic code for the data 1100.
   (ii) Draw the encoder and show how Parity bits are generated for the data sequence 1100. Compare with (1).
   (iii) Draw the decoder for the same and obtain the syndrome for the received codeword 1011010.

5. (a) A convolutional encoder has single shift register with three Modulator, two adder and an output multiplexer. The following generator sequence are combined by the multiplexer to produce the encoder output **12**

$$g_1 = 010 \; ; \quad g_2 = 110 \; ; \quad g_3 = 111$$

   (i) Draw block diagram of the encoder.
   (ii) for the I/P message sequence 01101 determine the output sequence of the encoder.
   (iii) Draw the state and trallier diagram for the same.

(b) A communication receiver receive, the following codeword : **8**

01101001

Decode the received codeword using Viterbi algorithm, consider the same encoder design an in **Q5(a)**.

6. (a) Describe the expression for error probability of a matched filter and justify that P_e doesnot depend on the shape of the input waveform. **10**
   (b) Explain the basic principle of frequency hopped spread spectrum. **5**
   (c) Differentiate with proper waveform slow frequency hopping and fast freqeuency hopping. **5**

7. (a) A PN sequence is generated using a feedback shift register of length three with [3, 1] feedback taps. **10**
   (i) Draw the schematic arrangement.
   (ii) Find the generated output of the initial contents of the shift register is 101.
   (iii) If the chip rate is 10^6 chips/sec. Calculate the length of PN sequence.

(b) Differentiate between (any **two**) :— **10**
   (i) BPSK, BFSK and BASK
   (B.W required, Noise, transmission rate efficiency and application)
   (ii) Line coding, source coding and channel coding.
   (coding scheme, type and application)
   (iii) Duo Binary and Modified Duo Binary encoding.