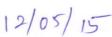
T.E-SEM I-CBGS-EXTC-D.C.



O.P. Code: 5127

(3 Hours)

[Total Marks: 80

N.B:

(1) Question No.1 is compulsory.

- (2)Attempt any three out of remaining five questions.
- (3)Figures to the right indicate marks.

1. Attempt any four:

- Consider an extremely noisy channel having a bandwidth of (a) 1 kHz. What could be the channel capacity?
- Consider a binary data sequence 1111101111. Draw the waveforms 5 for the given binary data sequence, using Bipolar AMI RZ and Manchester.
- State two criteria which a spread-spectrum communication system (c) 5 must satisfy. Justify that the spread-spectrum signals are transparent to the interfering signals, and vice-versa.
- What is the significance of Euclidian distance? (d)
- Define code rate, hamming distance and Hamming weight in the (e) context of linear block code .Also explain linearity property and cyclic property of linear codes.
- 2. (a) Consider an alphabet of a discrete memory less source having five 10 different source symbols with their respective probabilities as 0.1, 0.2, 0.4, 0.1, and 0.2.
 - Create a Huffman Tree for Huffman source coding technique.
 - Tabulate the codeword and length of codewords for each source (ii)
 - Determine the average codeword length of the specified discrete memoryless source.
 - (iv) Comment on the results obtained
 - (b) A convolution code is described by generator sequence G₁=(1, 1, 1) and 10 $G_{2}=(1,0,1)$
 - Draw the encoder for this code. (i)
 - (ii) Draw the state transition diagram for this code.
 - (iii) Draw the trellis diagram for this code.

TURN OVER

- 3. (a) Explain how matched filter and Correlator are two ways of synthesizing optimum filter. What is matched filter?
 - (b) For a Quadrature Phase Shift Keying (QPSK), Explain the modulator, synchronous demodulator, Bandwidth and advantages.
- 4 (a) What is coherent demodulator? Describe coherent detection method of binary FSK signals. Also draw power spectra for BFSK modulated signal.
 - (b) In a 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 communications channel for
 - (i) 8-ary PSK system
 - (ii) 16-ary PSK system.
- 5. (a) Parity check matrix for (7, 3) code is given below:

H = $\begin{bmatrix} 0111000 \\ 1010100 \\ 1100010 \\ 1110001 \end{bmatrix}$

Construct syndrome table for signal bit error patterns. Using syndromes, find error pattern and codeword for each of the following received vectors $r_1 = 0011101$, $r_2 = 1101110$.

- (b) A (7. 4) cyclic code is described by a generator polynomial $g(x) = 1 + x + x^3$
 - (i) Find the codeword using polynomial division method for m = 1010
 - (ii) Design an encoder for systematic code generation and explain its working.
 - (iii) Design a syndrome generator and explain how received message is corrected?

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- 6 Attempt the following (any two):
 - (a) What do you mean by an eye diagram? What is its purpose? Mention the four parameters observed from the eye pattern. Explain with the help of suitable illustration.
 - (b) Explain with the help of block diagrams and waveforms, the following techniques of spread spectrum communication.
 - (a) Direct sequence (b) Frequency hopping.
 - (c) Viterbi decoding algorithm for convolution codes.