

Q.P. Code : 591502

(3 Hours)

[ Total Marks : 80

- N.B. :** (1) Question No. 1 is compulsory.  
 (2) Attempt **any three** questions from the remaining **five** questions.  
 (3) Assume suitable data if required, stating them clearly.

1. Answer the following questions:

- What is the significance of AWGN channel.
- What is the capacity of a Gaussian channel and state its importance.
- Differentiate between QPSK and OQPSK.
- Discuss on code efficiency and Hamming bound.
- Explain the significance of eye pattern.

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2. (a) Develop MSK waveform (with all intermediate waveforms) for the given bit stream 11000111 for  $m=5$  &  $n=1$  on the graph paper.

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(b) A (7,4) cyclic code is generated using the polynomial  $x^3 + x + 1$

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(a) Generate the systematic cyclic code for the data 1100.

(b) Draw the encoder & show how parity bits are generated for the data 1100.

3. (a) Compare BASK, BFSK & BPSK based on following parameters:- bandwidth requirement, noise immunity, transmission rate, efficiency & applications.

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(b) The parity check matrix  $[H]$  of linear (7,4) block code is as follows:

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

- Find generator matrix
- Determine the code vector for:  $M_1 = 1010$  &  $M_2 = 1110$ .
- Draw the encoder using shift registers & EX-OR gates.
- Obtain syndrome matrix for following received sequences:  
 $R_1 = 0100101$  &  $R_2 = 1110100$
- Comment on syndrome calculated in above (d).

TURN OVER



4. (a) A three digit message is transmitted over a noisy channel having a probability of error  $P_e = (2/5)$  per digit. 10
- (i) Determine Probability of occurrence of errorless message.
  - (ii) Determine Probability of message having error in any two digits
  - (iii) Determine Probability of message having error in all digits
  - (iv) Plot the all possible probabilities of occurrence of error
- (b) Compare the direct sequence spread spectrum (DSSS) and frequency-hop spread spectrum (FHSS) with respect to principle and performance. Explain processing gain and jamming margin. 10

5. (a) Find the probability of error of matched filter. Comment on your results. 10
- (b) A discrete memoryless source has in alphabet of five symbol with their probabilities as shown below: 10

Symbol	S1	S2	S3	S4	S5
Probability	0.15	0.11	0.19	0.40	0.15

- Construct :
- (a) Huffman Code for each symbol.
  - (b) Shannon Fano Code for each symbol

Determine following parameters for both coding methods (a) and (b):

- (i) Average Code-word length
  - (ii) Entropy
  - (iii) Code Efficiency
  - (iv) Code Redundancy
6. (a) Draw signal space diagram for 16-QAM system and compare probability of occurrence of error in it with QPSK system. 10
- (b) State Nyquist's Criterion for distortion less Transmission. State its significance in Duo-binary encoding. 10