

(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.

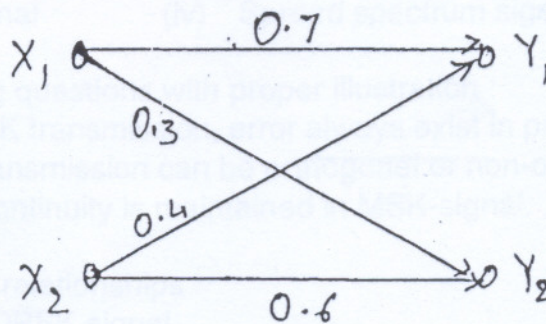
1. Attempt any four from the following :—

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- Define Probability. Explain Conditional and Joint Probabilities.
- What is Intersymbol Interference? Justify the code relative coding introduces controlled amount of ISI?
- Explain the advantage of gray coding of the Input to 8-ary PSK system? Also draw the phaser diagram of 8-ary PSK.
- Distinguish between Matched filter and Correlator. How they are related to each other?
- What is the necessity of spread spectrum modulation? Differentiate between slow frequency hopping and fast frequency hopping.

2. (a) Consider a binary input-output channels shown below :

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If the source symbols are equiprobable, find the receiver probability distribution  $P[Y]$  and the Joint probability distribution  $P[XY]$ .

- (b) A discrete memoryless source has an alphabet of five symbol with there probabilities as shown :

Symbol	$S_1$	$S_2$	$S_3$	$S_4$	$S_5$
Probability	0.40	0.19	0.16	0.15	0.15

- Construct a Shannon-Fano code for the source and calculate code efficiency  $\eta$  and redundancy of the code. 6
- Repeat the same for Huffman Code 6
- Compare the Huffman and Shannon-Fano Code. 4

3. (a) For a systematic linear block code the three parity check digits  $C_4, C_5, C_6$  are given by 10

$$C_4 = d_1 \oplus d_2 \oplus d_3$$

$$C_5 = d_1 \oplus d_2$$

$$C_6 = d_1 \oplus d_3$$

- Construct generator matrix
  - Construct code generated by this matrix
  - Determine error correcting capability
  - Prepare suitable decoding table
  - Decode the received code word 101100 and 000110
- (b) Explain the Viterbi algorithm of convolutional codes. 5
- (c) Compare linear Block codes, Cyclic codes and Convolutional codes. 5

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4. (a) State and explain the condition for orthogonality of the BFSK signal. Determine its spectrum and hence the bandwidth requirement for transmission of signal. 10
- (b) Explain 4-ary PSK alongwith the following lines :—
- (i) Offset and Non-offset QPSK 2
  - (ii) Modulation and demodulation block diagram of offset QPSK. 4
  - (iii) Plot of power spectral density 2
  - (iv) Signal space-representation and hence Euclidian distance. 2
5. (a) Show that for an input signal which is an sequence of rectangular positive and negative pulses, the integrator is the matched filter. 10
- (b) Explain the meaning of equalizer. How is equalization achieved ? With the help of neat block diagram. Explain tapped-delay line equalizer. 10
6. (a) What is duo-binary encoding ? Explain with neat block diagram. How the duo-binary encoding reduces the Bandwidth requirement ? 10
- (b) Draw the block diagram of DS-SSS transmitter and receiver. Obtain the expression for the signal at the output of each block and show that the original sequence can be recovered at the receiver output. 10
7. Write short notes on any **four** :— 20
- (a) Linear predictive vecoders
  - (b) Line codes
  - (c) P-N sequence generator
  - (d) Lempel-Ziv coding
  - (e) Optimum filter.