

Duration: 03 hours

Total marks : 80

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

Q. 1 Answer the following questions: (20)

- (a) Compare BASK, BFSK & BPSK based on following parameters:-bandwidth requirement, noise immunity, efficiency & applications.
 (b) State and explain Shannon's theorem for channel capacity.
 (c) Explain a decoding scheme which prevents error propagation in a duo-binary system.
 (d) Differentiate between MSK and offset QPSK.
 (e) Draw signal constellation diagram for 16-ary QASK and find its Euclidian Distance .

Q.2 (a) Explain the significance ISI in digital communication system. How is it caused? How it can be avoided? Derive the expression for Nyquist's condition for Distortion-less transmission. (10)

- (b) A discrete memory less 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

- (i) Construct Huffman Code for each symbol and determine following parameters: Entropy, Average Code word length, Code Efficiency and Code Redundancy
 (ii) determine the above parameters for Shannon-Fano code

Q.3. (a) The Generator vectors for a convolution encoder with code rate 1/3 are $g_1 = 110, g_2 = 101, g_3 = 111$

- (i) Draw Encoder diagram and determine code word for input vector (10111)
 (ii) draw trellis diagram and state diagram (10)

- (b) Justify that MSK is a frequency shift keying with relevant expressions. (5)
 (c) Explain the working of Matched filter in communication receiver (5)

Q.4 (a) If a data bit sequence is 101100111010, Draw (i) offset and non offset QPSK waveforms, (ii) BFSK waveform (6)

- (b) Write the mathematical expression of DPSK transmitted signal and explain DPSK transmitter and receiver. Draw the DPSK waveform for the sequence given in 4(a). (8)

- (c) Explain Duo binary encoder –decoder. Show how the given sequence 1100101001 is recovered at the receiver. (6)

- Q. 5 (a) A (7,4) cyclic code is generated using the polynomial $g(x) = (1 + x + x^3)$
- (i) Generate the systematic cyclic code for the data 1001 and 1010(MSB) by long division method
 - (ii) Draw the encoder & show how codewords are generated for the same data given above, by tracing the path through the encoder and verify the result. (10)
- (b) With respect to 8-ary PSK, explain the following:
- (i) block diagram of transmitter and receiver
 - (ii) mathematical expression of the transmitted signal
 - (iii) sketch its PSD and indicate its bandwidth
 - (iv) draw its signal space diagram and find its Euclidian distance (10)

- Q. 6 (a) What is spread spectrum modulation? Bring out the significance of PN Sequence. Explain Direct sequence Spread Spectrum, DS-BPSK. Write the expressions for Processing gain and Jamming Margin (10)
- (b) With a neat diagram, explain the working of Integrate and Dump Receiver. Derive the expression for its Probability of error. (10)

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