

01/06/15**QP Code : 3315****(3 Hours)****[Total marks: 80****N.B:1. Question No.1 is compulsory****2. Answer ANY THREE questions from Q2 to Q6****Q1. Answer (ANY FIVE)**

- (a) State and explain central limit theorem. (2)
- (b) State and explain Shannon's theorem. (4)
- (c) Why MSK is called shaped QPSK? (4)
- (d) What is EYE PATTERN? Explain its significance. (4)
- (e) Define Probability. Explain Conditional and Joint Probabilities. (4)
- (f) Differentiate between Fast frequency hopping and slow frequency hopping. (4)
- (g) Differentiate between Offset QPSK and Non-Offset QPSK. (4)

Q2. (a) A discrete memory less source has an alphabet of five symbols with the probabilities-

Symbol	S1	S2	S3	S4	S5
Probability	0.35	0.23	0.16	0.10	0.16

- (i) Construct Huffman code . find entropy and average length of the code
- (ii) Calculate code efficiency and the redundancy of the code.
- (iii) Construct Shannon-Fano code and find its efficiency (10)
- (b) What is Pseudo-noise (PN) Sequence in spread spectrum technology? Why they are used in spread spectrum modulation system? (05)
- (c) Compare Inter channel Interference and Inter symbol interference (05)

Q3. (a) Show that for an input signal which is a sequence of rectangular positive and negative pulses, the integrator and Dump Filter is the Matched filter. Bring out the properties of Matched Filter (10)

(b) Explain 4-ary PSK with respect to the following :-

- (i) Modulation and demodulation block diagram of Offset QPSK.
- (ii) Plot the Power Spectral density with relevant frequencies and hence Bandwidth.
- (iii) Mathematical expression of the transmitted signal, Signal space representation and hence Euclidian distance. (10)

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Q.4. (a) For a systematic linear block codes the three parity check digits C4, C5 and C6

are given by:

(10)

$$C4 = d1 \oplus d3$$

$$C5 = d1 \oplus d2 \oplus d3$$

$$C6 = d2 \oplus d3$$

(i) Construct generator matrix and parity check matrix

(ii) Construct codes generated by this matrix

(iii) Determine error detection and correction capability

(iv) Decode the received codeword $R(s) = 1\ 0\ 11\ 00$.

(b) A convolution encoder has single shift register with two stages three Modulo-2

(10)

adders and an output multiplexer the following generator sequence are combined

By the multiplexer to produce the encoder O/P:

$$g1=(1,1,1), g2=(1,0,1), g3=(1,1,0)$$

(i) Draw the block diagram of the encoder

(ii) Obtain the O/P for the data: $D = \{1\ 0\ 1\ 1\ 0\ \text{LSB}\}$

(iii) Sketch the code tree and trace the path corresponding to the message sequence D in (ii)

(iv) Draw the trellis diagram for the encoder.

Q.5. (a) With the help of neat block diagram and waveform, explain how a message transmitted in BFSK? What type of receiver is used for BFSK reception?

(10)

(b) Prove that for the 16-ary QASK digital modulation technique, the Euclidean distance is given by:

$$d = 2 \sqrt{0.4 E_b}$$

Where E_b is normalized energy per bit also draw signal constellation diagram for 16-ary QPSK and Compare with 16-ary QASK.

(10)

Q.6. (a) An Analog Signal is band limited to 8 Hz sampled at Nyquist rate and Quantized at 5 levels with probabilities 0.5, 0.125, 0.0625, 0.25 and 0.0625. Calculate entropy and information.

(b) Explain with neat block diagram the Matched filter.

(5)

(c) What is optimum receiver? Explain in detail.

(5)

(d) Explain Lempel-Ziv Coding in detail

(5)

(5)
