TE / ETRX / V (REV) 6/6/12

Digital Commu. & Coading Techniques

131-y2-Supq-FH KL12 8

Con. 4736-12. GN–9356

(3 Hours) [Total Marks : 100

N.B. : (1) Question No. **1** is **compulsory**.
(2) Answer any **four** questions out of the remaining **six** questions.
(3) Assume any **suitable** data wherever required but justify the **same**.

1. Answer any **four** questions : **20**
   (a) Justify that mean and variance of Poisson distribution are same.
   (b) A 2 kHz Channel has signal to noise ratio of 24 dB. Calculate maximum capacity of this Channel. Assuming constant transmitting power calculate maximum capacity when channel B.W. is halved.
   (c) What is intersymbol interterence ? How does it arise and visualize in a communication system ?
   (d) The bit stream 10110110 is to be transmitted using DPSK. Determine the encoded sequence and transmitted phase sequence. Why detection of DPSK doesnot require a differential decoder ?
   (e) What are the various application of spread spectrum system ? Define DS—CDMA.

2. (a) A communication system transmits 5 digits over a noisy channel with per digit error Probability of 0·01. What is the Probability that upto 2 digits will be in error ? Also calculate mean and variance of the error. Use Binomial Probability Distribution. **8**
   (b) A discrete memoryless source has six symbol x_1, x_2, x_3, x_4 and x_5, x_6 with probabilities 0·3, 0·12, 0·12, 0·16, 0·15, 0·15 attached to every symbol. **10**
      (i) Construct a Shannon-fano code for the source and calculate code efficiency η.
      (ii) Repeat (i) for Huffman code and calculate code efficiency η.
   (c) Compare the two techniques of source coding on the basis of entropy and code efficiency. **2**

3. (a) Consider a (8, 4) Systematic block code whose check equation are— **10**

$$C_5 = d_1 + d_2 + d_4$$
$$C_6 = d_1 + d_2 + d_3$$
$$C_7 = d_1 + d_3 + d_4$$
$$C_8 + d_2 + d_3 + d_4$$

Where d_n = Menage bits
C_n = Parity check bits
t = Ex-OR

   (i) Find the generator matrix and the Parity check matrix for this code.
   (ii) List all code words.
   (iii) How many errors can be detected and corrected ?

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(b) Design the generator matrix of $G(\bar{p}) = P^3 + P + 1$ (7, 4) cyclic code and find the code vector for the menage M = (1011). 5

(c) Design the encoder for above question (3, b) and generate code vector for the same message bit M = 1011. 5

4. (a) Differentiate between Linear block codes and Convolutional code. 10
A rate 1/3 Convolutional Coder with constraint length of '3' uses the generating vector.

$g_1 = 100$, $g_2 = 101$, $g_3 = 111$

(i) Sketch encoder configuration and prepare the logic table.

(ii) For the input sequence 10111 determine the output data sequence.

(b) Sketch generalized state diagram and tree diagram for the above question (4 9). 5

(c) Decode the Received sequence 1101 by using Viterbi algorithm. 5

5. (a) What are the drawbacks of duobinary encoder ? How can they be remedied ? 8

(b) Differentiate between — 8

(i) Orthogonal and Nonorthogonal BFSK

(ii) Offset and Nonoffset QPSK

(c) Draw the signal space diagram of 8–ary PSK and write the euclidean distance for the same. 4

6. (a) Differentiate between QASK and QPSK. Explain QASK system with its transmitter, receiver and signal space representation. 10

(b) What is a correlation receiver in a coherent communication system ? Derive an expression for the output signal to noise ratio. Is it an optimum receiver ? 10

7. (a) What is Processing gain and jamming margin of spread spectrum system ? Prove that effective jamming power depends upon rate f_c of the PN sequence. 10

(b) Write short notes on the following (any **two**) :— 10

(i) Fast freq hop spread spectrum system

(ii) MSK (minimum shift keying)

(iii) Lempel Ziv Coding.
