TE/ETRx/Sem VI/Rev
Dig. Comm & Coding Techni

Con. 6063-10. **(REVISED COURSE)** **GT-6696**

21/12/10

(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 **suitable** data wherever **necessary** and justify it.

1. (a) Is it logical in source coding to assign less probable symbol longer string and more probable ones shorter ? Explain. **20**
(b) Define error control coding. Explain code rate, code efficiency and Hamming distance.
(c) Define Random Variable. Explain CDF and PDF.
(d) Write a note on PN sequence generator.

2. (a) How the capacity of a White Gaussian channel is calculated ? Explain bandwidth-S/N trade-off for the same. **6**
(b) A data stream to be coded is 18 repeating '10' starting with 1 :— **6**
(i) Show how parsing is done in LZ coding of this data.
(ii) If number of prefix used is 8, show how this data is encoded.
(c) For binary data sequence 1011001 sketch waveforms of :— **8**
(i) NRZ(polar)
(ii) BASK
(iii) BPSK
(iv) BFSK.

3. (a) What are Cyclic codes ? Why they are called sub class of Block codes ? Implement a (7, 4) Cyclic code encoder with $g(x) = x^3 + x^2 + 1$ and show that the code can be generated for $d_1 = 1010$ and $d_2 = 1011$. **10**
(b) Consider a (7, 4) systematic Block code with parity check equations :— **10**

$c_1 = a_1 \oplus a_2 \oplus a_3$

$c_2 = a_1 \oplus a_2 \oplus a_4$

$c_3 = a_1 \oplus a_3 \oplus a_4$

where a_1, a_2, a_3, a_4 are message bits,

c_1, c_2, c_3 are parity chick bits.

(i) Find 'G' and 'H' matrices.
(ii) Find code words for message 1101 and 0011.
(iii) For the received message 1100010, find the syndrome and hence the transmitted message.
(iv) Explain the encoder and decoder with block diagram.

4. (a) Explain ISI and ICI. What causes them ? Explain how they can be overcome ? 8
   (b) Explain the QASK system w.r.t. transmitter, receiver block diagram and signal space representation. 8
   (c) Compare MPSK and MFSK. 4

5. (a) Show how duobinary decoding is done when input {d(K)} = {0, 1, 1, 1, 0, 1, 0, 1, 1 ---------- } is 10
      (i) Precoded and
      (ii) not precoded
      (iii) Show in each case what happens if 4th bit is detected wrongly.
   (b) Explain QPSK with following points :— 10
      (i) Offset and Non-offset QPSK.
      (ii) Modulation block diagram of offset QPSK.
      (iii) Demodulation block diagram.
      (iv) Power spectral density plot, signal space representation and Eucledian distance.

6. (a) Derive the expression for signal to noise ratio of Integrate and Dump receiver filter. 10
   (b) Explain with neat block diagram, DS/BPSK system. What is processing gain and jamming margin ? 10

7. Write short notes on any **four** :— 20
   (a) Central limit theorem.
   (b) Viterbi algorithm.
   (c) FH spread spectrum.
   (d) Eye pattern.
   (e) Line codes.