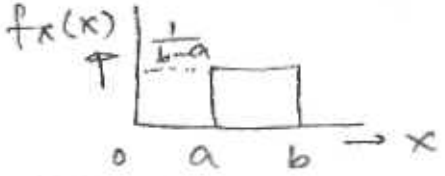
T.E. (ETRX) Sem. V
Digital Communication and codi
Techniques

Con. 3539–11. RK–2235

(3 Hours) [Total Marks : 100

N.B. : (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** questions from remaining questions.
(3) Assume **suitable** data wherever **necessary**.

1. (a) How many bits are required to represent 26 letters of English alphabet in binary code. 5
(b) Justify : In a DPSK receiver, the bit errors tend to occur in pairs. 5
(c) Define processing gain and Jamming margin with reference to CDMA. Write the formula giving maximum number of customers who can share a given bandwidth in CDMA. 5
(d) PDF of a continuous random variable is given below :– 5



Find its CDF and Plot it.

2. (a) Explain the following terms :– 10
(i) Hamming bound (ii) Free distance (iii) Code rate (iv) Coding gain (v) Systematic Codes.
(b) What is eye pattern ? Explain how raised cosine spectrum reduces ISI. 10

3. (a) Explain Lempel Ziv coding. 10
(b) The convolutional encoder has single shift register with two stages are three modules-2 adders and output multiplexer. The following generator sequences are combined by multiplexer to produce the encoder output. 10
$g_1 = 101$ $g_2 = 110$ $g_3 = 111$.
Draw the block diagram of the encoder and determine encoded sequence for message sequence 10011.

4. (a) Prove that the maximum signal to noise ratio of integrate and dump filter receiver is given as $\rho_{max} = \frac{2E}{No}$; when the input signal x(t) is rectangular pulses of amplitude ±A and duration 'T'. 10

(b) What is minimum in MSK ? Why is MSK called shaped QPSK ? 10

5. (a) Find all code vectors for a (6, 3) block code if generator matrix is – 10

$$G = \begin{bmatrix} 1 & 0 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 1 & 1 & 0 \end{bmatrix}$$

(b) The PDF of Gaussian distribution is given as $f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-(x-m)^2/2\sigma^2}$ 10

Prove that mean is m and variance is σ^2.

6. (a) Compare the following :– 10
   (i) Offset QPSK with Non offset QPSK
   (ii) 16PSK with 16 QASK.

(b) Explain significance of Shanon Hartley Law. 5

(c) Describe principal steps involved in the direct spreading method for CDMA. 5

7. Write short notes on :– 20
   (a) Viterbi algorithm
   (b) Duobinary Schemes
   (c) BPSK reception
   (d) Optimum receiver.