Exam.Code:0930
Sub. Code: 33675

2056

B.E. (Electronics and Communication Engineering)-6th Semester

EC-603: Digital Communication

Time allowed: 3 Hours Max. Marks: 50

NOTE: *Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Unit.*

x-x-x

1. (a) Give the condition for Orthogonality for basis function.

   (b) Why is carrier recovery important in coherent PSK detection?

   (c) Why BER of BPSK is lower than BFSK?

   (d) Why direction-of-arrival estimation isimportant in SDMA?

   (e) Why Nyquist pulses occupy minimum bandwidth for zero ISI transmission. (5x2)

UNIT - I

2. Consider $s_1(t) = \begin{cases} 1, & 0 \le t < 1 \\ 0, & \text{otherwise} \end{cases}$, $s_2(t) = \begin{cases} 1, & 0 \le t < 2 \\ 0, & \text{otherwise} \end{cases}$, $s_3(t) = \begin{cases} t, & 0 \le t < 1 \\ 0, & \text{otherwise} \end{cases}$

   and $s_4(t) = \begin{cases} 1-t, & 0 \le t < 1 \\ 0, & \text{otherwise} \end{cases}$

   Apply Gram–Schmidt procedure to obtain orthonormal basis functions. (10)

3. (a) Explain coherent and non-coherent PSK detection techniques.

   (b) Explain I-Q modulation and demodulation in QAM systems. (2x5)

4. (a) Consider a (3,1,2) convolutional encoder with g^{111}=110, g^{121}=101, g^{131}=111.

   (i) Build the encoder diagram.

   (ii) Compute the code word for message sequence (11101).

   (b) Consider a rate ½ convolutional encoder with generators: $g_1 = 111$ *and* $g_2 = 101$ with constraint length: $K = 3$. Determine most likely transmitted sequence using soft-Viterbi decoding for the received noisy sequence: (0.9,1,2), (1,1,-0.8) and (-0.9, 1,0). (2x5)

UNIT - II

5. (a) A TDMA sysem has 8 users sharing a channel of bandwidth 200 kHz. If each user transmits for 1 ms in a frame, calculate: (5)

   (i) Total frame duration

   (ii) Duty cycle of each user

   (iii)Effective transmission rate per user

P.T.O.

(b) Two CDMA users employ codes:

$$C_1 = (1,-1,1,-1), \quad C_2 = (1,1,-1,-1)$$

If transmitted bits are $+1$and -1, determine:

(i) Combined transmitted signal

(ii) Recovered data for User-1 using correlation decoding. (2x5)

6. (a) Explain how DS spread spectrum provides resistance against interference and interception. Also explain concept of the effects of narrowband jamming and wideband jamming.

(b) Explain the generation and security of hopping patterns in FH communication systems. (2x5)

7. (a) Derive the condition for zero ISI in time and frequency domain.

(b) Explain symbol timing recovery in pulse detection systems. Also explain timing jitter effects in detection of shaped pulses. (2x5)

x-x-x