B.E. Sixth Semester (Electronics Engineering/ Electronics Telecommunication / Electronic Communication Engineering) (C.B.S.)

# Digital Communication

P. Pages : 3 **KNT/KW/16/7382/7387**

Time : Three Hours Max. Marks : 80

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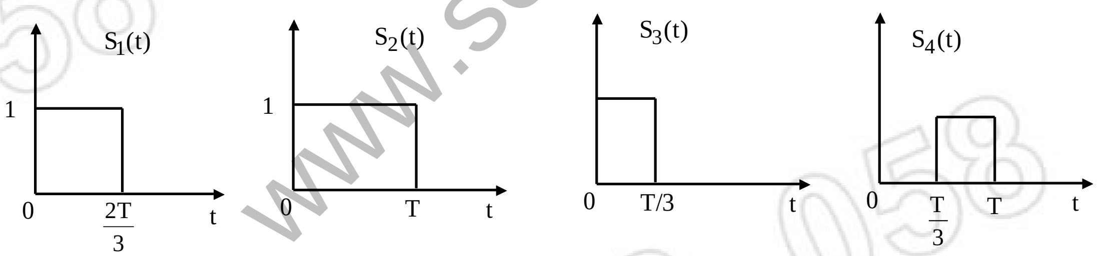
Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Solve Question 11 OR Questions No. 12.
8. Due credit will be given to neatness and adequate dimensions.
9. Assume suitable data whenever necessary.
10. Diagrams and chemical equations should be given whenever necessary.
11. Illustrate your answers whenever necessary with the help of neat sketches.
12. Use of non programmable calculator is permitted.

**1.** a) Draw & explain basic block diagram of digital communication system. **7**

b) Explain the central Limit Theorem. **6**

**OR**

**2.** a) Consider the signals $S_1(t), S_2(t), S_3(t) \& S_4(t)$ as shown in figure below: **7**




Using the Gram-Schmidt orthogonalization procedure find the orthonormal basis functions of the above signal set.

b) Explain the concept of Matched Filter Receiver with its properties. **6**

**3.** a) A discrete memoryless source S, produces the symbols A, B & C with probabilities $0 \cdot 4$, $0 \cdot 25$ & $0 \cdot 35$ respectively. **7**

a) Design a Huffman code for this source and determine its coding efficiency.

b) Design a Huffman code for the second order extension of this source and find the average length of the code word for this code. What is the coding efficiency ?

b) Explain the concept of scalar & vector quantization. **6**

**OR**

**4.** a) Write a note on **any two.** **6**

i) Adaptive sub band coding

ii) LP & CELP coding

iii) ADPCM

b) Encode the following binary sequence using Lempel - Ziv coding scheme 111010011000101.
Assume that binary symbols 0 & 1 are already there in the code book. **7**

**5.** a) Explain QPSK transmitter & receiver with waveforms & signal space representations of QPSK signals. **8**

b) The binary sequence 1100100010 is applied to the following transmitted of modulation system. Sketch the resulting waveform at the transmitter output for. **6**
i) DPSK
ii) BPSK & BFSK

**OR**

**6.** a) Explain the MSK system in detail. **8**

b) Write a note on: **6**
i) Linear & non-linear modulation with examples.
ii) CPM

**7.** a) Construct the Galois field i.e. $GF\left(2^4\right)$ whose modulo polynomial is given by $x^4+x+1$. Determine the minimal polynomial for the elements only for $\alpha^3 \& \alpha^5$ for the above case. **7**

b) Explain the different types of error control strategies & compare them. **7**

**OR**

**8.** A rate $\frac{1}{3}$ conventional encoder has the generator vectors as **14**
$g_1=[1\ 0\ 0], g_2=[1\ 0\ 1], g_3=[1\ 1\ 1]$
i) Draw the block diagram of the encoder
ii) Draw the code Tree
iii) Draw the Trellis Diagram
iv) Using Viterbi Algorithm find most likely data sequence if the received sequence is (111, 101, 010, 111).

**9.** a) Explain the Trellis code Modulation concept with block diagram. Also illustrate the partitioning of 16QAM - constellation. **8**

b) Write a note on Turbo coding. **5**

**OR**

**10.** a) What are the different parameters of Reed-Solomon codes & obtain the generator polynomial for (7, 3) double - error correcting R S code using $GF\left(2^3\right)$ whose modulo polymial is $X^3 + X + 1$. **8**

b) Write a note on LDPC codes. **5**

**11.** a) Explain the generation of PN sequence with any example & also explain the properties of the same. **5**

b) Explain the FHSS system in detail with slow & fast frequency hopping. **8**

**OR**

**12.** Write a note on **any two.** **13**

i) CDMA

ii) OFDM

iii) Synchronization method for spread spectrum system.

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