

Reg No.: \_\_\_\_\_

Name: \_\_\_\_\_

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**

Sixth semester B.Tech examinations (S), September 2020

**Course Code: EC302****Course Name: Digital Communication**

Max. Marks: 100

Duration: 3 Hours

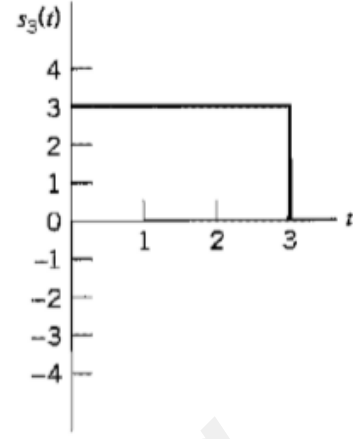
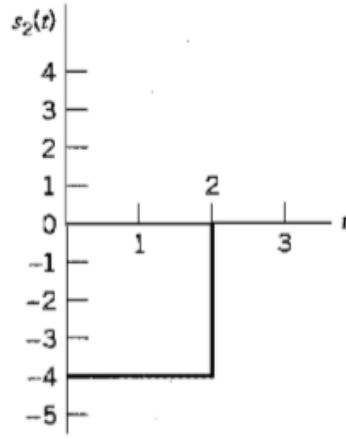
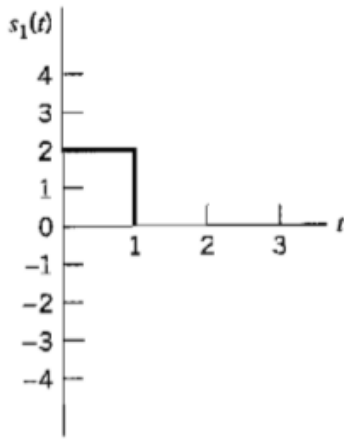
**PART A***Answer any two full questions, each carries 15 marks*

Marks

- 1 a) With the help of suitable block diagrams explain differential pulse code modulation. How does it differ from PCM and delta modulation? (8)
- b) With the help of block diagram, explain modified duobinary signalling scheme. (7)
- 2 a) Define sampling. Differentiate different types of sampling. With relevant derivation explain how to obtain samples from a message signal. (7)
- b) Given the data stream 1110010100, sketch the transmitted sequence of pulses for each of the following line codes: (3)
- 1) Unipolar nonreturn-to-zero
  - 2) Polar nonreturn-to-zero
  - 3) Manchester code
- c) Explain eye pattern and its significance. (5)
- 3 a) Prove the following two properties of autocorrelation function  $R_X(\tau)$  of a random process  $X(t)$ : (6)
- 1) If  $X(t)$  contains a DC component equal to A, then  $R_X(\tau)$  will contain a constant component equal to  $A^2$ .
  - 2) If  $X(t)$  contains a sinusoidal component, then  $R_X(\tau)$  will also contain a sinusoidal component of the same frequency.
- b) Derive the necessary condition to be satisfied by a delta modulator to avoid slope overload distortion if the input is a sine wave of frequency  $f_m$  and amplitude  $A_m$ . (4)
- c) With the help of necessary mathematical expressions explain inter symbol interference (ISI). (5)

**PART B***Answer any two full questions, each carries 15 marks*

- 4 a) Draw the constellation diagram for BFSK modulation and explain the generation and detection of BFSK signals with the help of block diagrams. (8)
- b) Derive an expression for probability of error for BFSK. (7)
- 5 a) Using Gram Schmidt orthogonalization procedure, find the orthonormal basis functions for the signals  $s_1(t)$ ,  $s_2(t)$ ,  $s_3(t)$  shown in the figure below (9)



- b) Explain correlation receiver with the help of suitable block diagrams (6)
- 6 a) With the help of diagrams explain a non-coherent modulation scheme. (8)
- b) Explain Maximum Likelihood Decoding. (7)

### PART C

*Answer any two full questions, each carries 20 marks*

- 7 a) With suitable block schematic, explain RAKE receiver and its relevance in CDMA systems. (9)
- b) What is spread spectrum modulation? Explain its significance and applications in the field of communication. (6)
- c) Explain the significance of PN sequences and explain the properties of PN sequences. (5)
- 8 a) With the help of relevant diagrams, explain OFDM. (10)
- b) In a DS/BPSK system, the feedback shift register used to generate the PN sequence has length  $m=19$ . The system is required to have an average probability of symbol error due to externally generated interfering signals that does not exceed  $10^{-5}$ . Calculate the following in decibels: (i) Processing gain; (ii) Anti-jam margin (10)
- 9 a) Explain the various multiple access schemes. (8)
- b) With the help of relevant block schematics, explain frequency hopping spread spectrum with MFSK. Distinguish between SFHSS and FFHSS (10)
- c) What are Gold codes? (2)

\*\*\*\*\*