

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VI (OLD) EXAMINATION – SUMMER 2022****Subject Code:161001****Date:08/06/2022****Subject Name:Digital Communication****Time:10:30 AM TO 01:00 PM****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

- Q.1 (a)** Draw and explain the block diagram of Pulse code Modulation (PCM). **07**
(b) Define Cumulative Distribution Function. State and prove the properties of CDF. **07**

- Q.2 (a)** Explain Delta Modulation using neat block diagram and waveforms. What are the disadvantages of Delta Modulation? How can we remove them? **07**
(b) Define the Probability Density Function. The PDF of amplitude X of a certain signal x(t) is given by $p_x(x) = 0.5|x|e^{-|x|}$, Determine the probability that: (1) $X \geq 1$ (2) $-1 < X \leq 2$ (3) $X \leq -2$. **07**

OR

- (b)** A zero-memory source emits four messages with probabilities 0.5, 0.3, 0.1 and 0.1. **07**
 Find the entropy of the source. Obtain the compact binary code and find the average code word length, the efficiency, and the redundancy.

- Q.3 (a)** State and prove Central Limit Theorem. **07**
(b) Which the ideal properties of line codes. Compare Polar, On-Off and Bipolar signaling with respect to desirable properties of line codes using necessary equations. **07**

OR

- Q.3 (a)** Write a short note on: Scrambling. **07**
(b) Why pulse shaping is required? What is Inter Symbol Interference? Explain Nyquist second criterion for partial ISI. **07**

- Q.4 (a)** Derive the equation for channel capacity of a band-limited AWGN channel. **07**
(b) For (6, 3) systematic linear block code, the three parity check digits c_4 , c_5 and c_6 are **07**

$$c_4 = d_1 + d_2 + d_3$$

$$c_5 = d_1 + d_2$$

$$c_6 = d_1 + d_3$$

- (a) Construct the code generated by this matrix.
- (b) Prepare a suitable decoding table.
- (c) Decode the received codeword 101100.

OR

- Q.4 (a)** Derive the equation for channel capacity of discrete memoryless channel. **07**
(b) Explain the principle and generation of cyclic code by example. **07**

- Q.5 (a)** Explain the operation of BPSK transmitter and receiver. **07**
(b) Explain coherent detection of Amplitude-Shift keying (ASK) signal with necessary equations. **07**

OR

- Q.5 (a)** Explain the BFSK Modulation and demodulation in detail. **07**
(b) Which are the different types of spread spectrum systems? Draw and explain the block diagram of Frequency Hopping Spread Spectrum (FHSS) system. **07**
