

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-VI(OLD) – EXAMINATION – SUMMER 2019

Subject Code: 161001

Date: 18/05/2019

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.

- Q.1** (a) State and prove sampling theorem. **07**
 (b) Define Cumulative Distribution Function. State and prove the properties of CDF. **07**
- Q.2** (a) Draw and explain the block diagram of Pulse code Modulation (PCM). **07**
 (b) Define the Probability Density Function. Determine the mean, the mean square value and the variance of the RV X whose PDF is given by $p_x(x) = 0.5|x|e^{-|x|}$. **07**
- OR**
- (b) A zero-memory source emits six messages with probabilities 0.3, 0.25, 0.15, 0.12, 0.1 and 0.08. Find the entropy of the source. Obtain the compact binary code and find the average code word length, the efficiency, and the redundancy. **07**
- Q.3** (a) State and prove Central Limit Theorem. **07**
 (b) Which are the ideal properties of line codes. Derive the general expression for PSD of a large class of line codes. **07**
- OR**
- Q.3** (a) Write a short note on: Regenerative Repeater. **07**
 (b) Why pulse shaping is required? What is Inter Symbol Interference? Explain Nyquist first criterion for zero ISI. **07**
- Q.4** (a) Derive the equation for channel capacity of discrete memoryless channel. **07**
 (b) For a (6,3) code, the generator matrix G is **07**
- $$G = \begin{bmatrix} 1 & 0 & 0 & 1 & 1 & 1 \\ 0 & 1 & 0 & 1 & 1 & 0 \\ 0 & 0 & 1 & 1 & 0 & 1 \end{bmatrix}$$
- (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 a band-limited AWGN channel. **07**
 (b) Explain the principle and generation of convolution code by example. **07**
- Q.5** (a) Explain the operation of QPSK transmitter and receiver. **07**
 (b) Explain coherent detection of Frequency-Shift keying (FSK) signal with necessary equations. **07**
- OR**
- Q.5** (a) Explain the Quadrature Amplitude Modulation and demodulation in detail. **07**
 (b) Which are the different types of spread spectrum systems? Draw and explain the block diagram of Direct Sequence Spread Spectrum (DSSS) system. **07**
