

GUJARAT TECHNOLOGICAL UNIVERSITY
BE – SEMESTER – VI (NEW).EXAMINATION – WINTER 2016

Subject Code: 2161001**Date: 22/10/2016****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 that a signal whose spectrum is band-limited to B Hz can be reconstructed exactly from its samples taken uniformly at a rate $R > 2B$ Hz. Also explain the practical difficulties in signal reconstruction. **07**
- (b) A CD records audio signals digitally by using PCM. Assume the audio signal bandwidth to be 10 kHz. **07**
- i. What is the Nyquist rate?
 - ii. If the Nyquist samples are quantized into $L=65536$ levels and then binary coded, determine the number of binary digits required to encode a sample.
 - iii. Determine the number of binary digits per second (bits/s) required to encode the audio signal.
 - iv. Practical CDs use 44100 samples per second. If $L=65536$, determine the number of bits per second required to encode the signal, and the minimum bandwidth required to transmit the encoded signal

- Q.2** (a) Explain the working principle of 1-bit DPCM. What are the problems associated with it. **07**
- (b) Explain eye diagram. How ISI and other signal degradations can be studied using eye-diagram. **07**

OR

- (b) How does regenerative repeater work? What is the use of scrambler? **07**
- Q.3** (a) Explain DPSK and QPSK modulation scheme. **07**
- (b) What are NRZ, RZ and Manchester line coding schemes? Which of these is better and why? **07**

OR

- Q.3** (a) What is the difference between coherent and non-coherent detection technique? Describe non-coherent detection of PSK signal. **07**
- (b) Explain Quadrature Amplitude modulation. Compare 8-QAM with 8-PSK. **07**

- Q.4** (a) For a (7,4) linear block code **07**

$$P = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 0 \end{bmatrix}$$

Obtain the parity check matrix and check whether the received code word 1110111 is correct. Also find the corresponding decoding table.

- (b) Explain interlaced codes for burst and random error correction. **07**

OR

- Q.4 (a)** Describe Viterbi's algorithm used for decoding of convolutional codes **07**
(b) Explain the method for generating systematic cyclic code. A (7, 4) cyclic code with $G(X) = 1+X+X^3$, if $M=1001$ find the corresponding non-systematic and systematic cyclic code? **07**

- Q.5 (a)** In a random experiment, a trial consists of three successive tosses of coin. If we define the random variables as the number of trial appearing in a trial, determine PDF and the corresponding CDF. **07**
(b) A source emits five messages with probabilities $1/18, 2/9, 2/9, 1/6, 1/3$ respectively. **07**
i. Obtain the Huffman code.
ii. Find the average length of the code word.
iii. Determine the efficiency and the redundancy of the code

OR

- Q.5 (a)** In a binary communication channel, the receiver detects binary pulses with an error probability P_e . What is the probability that out of 100 received digits, no more than three digits are in error. **07**
(b) Define for a random variable **07**
i. Mean
ii. Central Moment
iii. Variance
iv. Standard deviation
