

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VI (NEW) - EXAMINATION – SUMMER 2016****Subject Code:2161001****Date:06/05/2016****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) Define random variable and find the mean, the mean square and the variance of the general Gaussian random variable. **07**
- (b) Explain briefly Nyquist's sampling theorem. What is Interpolation process? Derive Interpolation formula. **07**
- Q.2** (a) Derive channel capacity C if channel noise is additive, white Gaussian with mean square value N, given signal power S. **07**
- (b) A binary channel matrix is given by **07**
- $$\begin{matrix} & y_1 & y_2 \\ x_1 & 2/3 & 1/3 \\ x_2 & 1/10 & 9/10 \end{matrix} \quad x_1, x_2 = \text{input } y_1, y_2 = \text{output}$$
- $P_X(x_1) = 1/3$ and $P_X(x_2) = 2/3$. Determine $H(X)$, $H(Y)$, $H(X/Y)$, $H(Y/X)$ and $I(X;Y)$.
- OR**
- (b) A zero-memory source emits messages m_1 and m_2 with probabilities 0.8 and 0.2, respectively. Find the optimum (Huffman) binary code for this source as well as for its second - and third - order extension (that is, for $N = 2$ and 3). Determine the code efficiencies in each code. **07**
- Q.3** (a) What is line coding? What are the ideal requirements from line coding? Draw waveform of bipolar AMI coding for the sequence 10100101. **07**
- (b) Explain Delta Modulation in detail. Also discuss its advantages and disadvantages. **07**
- OR**
- Q.3** (a) What is Inter Symbol Interference? Explain the Nyquist's first criteria for zero ISI. **07**
- (b) What are the functions of regenerative repeater? Fully Explain the zero forcing equalizer with expressions. **07**
- Q.4** (a) Derive the general expression of Bit Error Rate (BER) for Optimum Binary Receiver. **07**
- (b) For ASK modulated signal, derive the expression of bit error probability using non-coherent detection. **07**
- OR**
- Q.4** (a) What is the multi-amplitude signalling? Derive the BER for the same using matched-filter receiver. **07**
- (b) Explain mathematical and graphical representation of BPSK. Explain BPSK generation. **07**
- Q.5** (a) Explain the generation of linear block code using suitable example. **07**
- (b) 1. Construct the systematic (7,4) cyclic code using the generator polynomial $g(x) = x^3 + x + 1$ **07**
2. What are the error correcting capabilities of this code?
3. Construct the decoding table.

4. If the received word is 1101100, determine the transmitted data word.

OR

- Q.5** (a) Explain QPSK with waveforms, constellation diagram and mathematical representation. **07**
- (b) Write short note on Convolutional coding. **07**
