

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER-VI • EXAMINATION – WINTER 2013

Subject Code: 161001**Date: 27-11-2013****Subject Name: Digital Communication****Time: 02:30 pm to 05:00 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. Answer the Following 14**
- (a) Draw the block diagram of digital communication system and explain the three major signal processing tasks. **04**
- (b) How would you detect and correct burst errors in digital communication? **04**
- (c) “The power spectral density and the correlation function of a periodic waveform are a Fourier transform pair” Justify. **03**
- (d) Briefly describe the concept of probability with suitable example. **03**
- Q.2 (a) Derive the equation for channel capacity of BSC channel. 07**
- (b) For a (6,3) systematic LBC the three parity check digits c_4 , c_5 and c_6 are **07**
- $C_4 = d_1 + d_3$
 $C_5 = d_1 + d_2 + d_3$
 $C_6 = d_1 + d_2$
1. Construct the code generated by this matrix
 2. Prepare a suitable decoding table
 3. Decode 100101 and 101010.
- OR**
- (b) A binary channel matrix is given by **07**
- | | | | |
|-------|-------|-------|----------------------------|
| | y_1 | y_2 | |
| x_1 | 2/3 | 1/3 | $x_1, x_2 = \text{input}$ |
| | | | $y_1, y_2 = \text{output}$ |
| x_2 | 1/3 | 2/3 | |
- $P_x(x_1) = 1/2$ and $P_x(x_2) = 1/2$. Determine $H(X)$, $H(Y)$, $H(X/Y)$, $H(Y/X)$ and $I(X;Y)$.
- Q.3 (a) Describe the Tchebycheff's inequality. 05**
- (b) Discuss decoding of cyclic codes with suitable example. **05**
- (c) “Hamming bound is a necessary but not sufficient condition for higher error correcting codes whereas is a necessary and sufficient condition for single error correcting codes”. Justify. **04**
- OR**
- Q.3 (a) Derive the formula for signal to quantization noise ratio for PCM. 05**
- (b) Discuss briefly power spectral density of NRZ and bi-phase code. **05**
- (c) A source emits one of four messages randomly every 1 microsecond. The probabilities of these messages are 0.5, 0.3, 0.1 and 0.1. Messages are independently generated (i) What is the source entropy? (ii) Obtain a compact binary code and determine the average length of the codeword, the efficiency and the redundancy of this code. (P.T.O.) **04**
- Q.4 (a) Explain briefly QPSK Demodulation with neat sketch. 05**
- (b) Explain briefly the Nyquist sampling theorem. **05**
- (c) State the central limit theorem. **04**
- OR**
- Q.4 (a) Explain briefly BPSK modulation with neat sketch. 05**

- (b) Compare PCM and Delta Modulation in terms of their figure of merits. **05**
- (c) Compare ASK and FSK in terms of their figure of merits. **04**
- Q.5** (a) Write short note on Convolutional coding. **07**
- (b) Write shortnote on Optimum binary receiver. **07**
- OR**
- Q.5** (a) What is companding process in PCM? State laws for the same. **07**
- (b) . Describe the effect of slope overloading and hunting in delta modulation. **07**
