

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE - SEMESTER-VI (OLD) EXAMINATION – WINTER 2018****Subject Code:161001****Date: 30/11/2018****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** (a) State and prove the Sampling theorem with necessary equation & waveforms. **07**  
 (b) In a random experiment, a trial consists of four successive tosses of a coin. If we define an RV  $x$  as the number of heads appearing in a trial, determine probabilities  $P_X(x)$  and CDF  $F_X(x)$ . **07**
- Q.2** (a) Define Delta modulation? Draw the neat diagram of Delta modulator & explain the operation with waveforms. **07**  
 (b) What is Cumulative Distribution Function (CDF)? Enlist the important properties of CDF? Prove any two of them. **07**
- OR**
- (b) Define : Code efficiency, Entropy, Redundancy, Binary Symmetric Channel. Mean, Standard Deviation & Moments of random variable. **07**
- Q.3** (a) A memory-less source emits messages  $m_1$  to  $m_6$  with probabilities 0.3, 0.25, 0.15, 0.12, 0.10, 0.08 respectively. Find the length of this code (L), entropy of source (H), code efficiency & redundancy for binary Huffman code. **07**  
 (b) What is line coding? Explain the desirable properties of line codes. **07**
- OR**
- Q.3** (a) Find the channel capacity of Binary Symmetrical Channel. **07**  
 (b) What is the need for pulse shaping? Explain Nyquist's Criterion for zero ISI. **07**
- Q.4** (a) Explain in details the Amplitude Shift Keying (ASK). **07**  
 (b) For a (6, 3) systematic linear block code, the three parity check digits  $c_4, c_5, c_6$  are  
 $c_4 = d_1 + d_2 + d_3$   
 $c_5 = d_1 + d_2$   
 $c_6 = d_1 + d_3$   
 (i) Construct the appropriate generator matrix for this code. (ii) Construct the code generated by this matrix. (iii) Determine the error correcting capabilities of this code. (iv) Prepare a suitable decoding table. **07**
- OR**
- Q.4** (a) Describe coherent & non-coherent detection of FSK signal. **07**  
 (b) State & Prove Central Limit Theorem. **07**
- Q.5** (a) What is Spread Spectrum system? Describe Direct Sequence Spread Spectrum System in detail. **07**  
 (b) Explain briefly BPSK modulation with neat sketch. **07**
- OR**
- Q.5** (a) Explain QPSK technique including QPSK transmitter & receiver. **07**  
 (b) Difference between Analog & Digital Communication System. Also explain block diagram of Digital Communication. **07**

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