Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI (OLD) - EXAMINATION – SUMMER 2017

Subject Code: 161001 **Date: 05/05/2017**

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 the Sampling theorem with necessary equation and waveforms.	**07**
	(b)	Explain Delta modulation and Delta demodulation with necessary block diagram and mathematical equation.	**07**
Q.2	**(a)**	Discuss the desirable properties of the line codes.	**07**
	(b)	Derive the expression of PSD for polar signaling and also draw its spectrum.	**07**
		OR	
	(b)	What is scrambling? Explain scrambling and descrambling process with block diagram and suitable example.	**07**
Q.3	**(a)**	Explain the block diagram of BPSK demodulation technique with mathematical expression.	**07**
	(b)	What is difference between coherent and non-coherent detection techniques? Discuss non-coherent detection of FSK signal.	**07**
		OR	
Q.3	**(a)**	A zero-memory source emits six messages with probabilities 0.3, 025, 0.15, 0.12, 0.1 and 0.08. Find the 4-ary Huffman code. Determine its average word length, the efficiency and the redundancy.	**07**
	(b)	Define entropy. Prove that entropy is maximum when all the messages are equiprobable.	**07**
Q.4	**(a)**	State and prove the Central limit theorem.	**07**
	(b)	In an experiment, a trial consists of four successive tosses of a coin. If we define an R.V. x as the number of heads appearing in a trial, determine PDF $P_x(x)$ and CDF $F_x(x)$ with its sketch.	**07**
		OR	
Q.4	**(a)**	Explain Cumulative Distribution Function (CDF) with its properties and proof.	**07**
	(b)	A binary symmetric channel (BSC) error probability is P_e. The probability of transmitting 1 is Q, and that of transmitting 0 is 1 – Q. Determine the probabilities of receiving 1 and 0 at the receiver.	**07**
Q.5	**(a)**	For a (7, 4) cyclic code, the generator polynomial $g(x) = x^3 + x^2 + 1$. Find nonsystematic cyclic code vector for the following data vectors: (i) 0001, (ii) 1000, (iii) 1010	**07**
	(b)	Confirm the possibility of a (18, 7) binary code that can correct up to three errors. Can this code correct up to four errors?	**07**
		OR	
Q.5	**(a)**	Explain the generation of codeword in linear block code technique with an example.	**07**
	(b)	Write a short note on Convolutional code.	**07**

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