Seat No.: _____ Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– VI (Old) EXAMINATION – WINTER 2019

Subject Code: 161001 **Date: 11/12/2019**

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.**

			MARKS
Q.1	**(a)**	Explain the advantages of digital communication over analog communication.	**07**
	(b)	What is a line code? Describe the desirable properties of line codes	**07**
Q.2	**(a)**	Draw neat diagram of delta modulator, delta demodulator, input waveform, output waveform and error waveform. Define slope overload and write the condition to avoid lope overload in delta modulation.	**07**
	(b)	Derive an equation of signal-to noise ratio for a uniform quantizer.	**07**
		OR	
	(b)	State Nyquist sampling theorem. Write the condition and name of the circuit to avoid aliasing. Discuss the applications of sampling theorem.	**07**
Q.3	**(a)**	Explain HDB3 signaling with an example. Draw it PSD.	**07**
	(b)	What is a regenerative repeater? Draw its block diagram and state the function of each block in 2-3 sentences.	**07**
		OR	
Q.3	**(a)**	Draw neat waveforms of data, carrier and modulated signals for ASK, FSK and PSK modulations. What is the difference in PSDs of ASK and PSK.	**07**
	(b)	State the Nyquist criterion for zero ISI. Draw time and frequency domain waveforms for the pulse that satisfies this criterion. Define roll-off factor.	**07**
Q.4	**(a)**	Define the following mathematically with reference to probability and random variables: Conditional probability, joint probability, CDF, PDF, Statistical mean, variance, correlation.	**07**
	(b)	State and explain central limit theorem.	**07**
		OR	
Q.4	**(a)**	Find the mean square value of quantization error in PCM considering uniform random variable approach	**07**
	(b)	Give mathematical expression of Gaussian PDF and CDF. Also, draw the curves for the CDF and PDF of Gaussian random variable. Define Q function and express the probability that Gaussian random variable is greater than some value x in terms of Q function.	**07**

Q.5	**(a)**	Define information and derive and expression for channel capacity of a Binary Symmetric Channel.	**07**
	(b)	Define following with reference to error detecting and correcting codes: Code efficiency, Hamming bound, perfect code, generator polynomial, interlaced code, code tree, burst error-detecting/correcting code.	**07**

OR

Q.5	**(a)**	Design an optimum binary receiver and compute error probability for 16-QAM system. Assume all messages are equi-probable and AWGN channel.	**07**
	(b)	Explain the coherent detection of ASK signal with neat diagram, waveforms and relevant expressions.	**07**

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