

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VI(OLD) EXAMINATION – WINTER 2022****Subject Code:161001****Date:16-12-2022****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.
4. Simple and non-programmable scientific calculators are allowed.

		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 slope 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 its 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 an expression for channel capacity of a Binary Symmetric Channel.	07

(b) Define following with reference to error detecting and correcting codes: **07**

Code efficiency, Hamming bound, perfect code, generator polynomial, interlaced code, code tree, burst error-detecting/correcting code.

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**
