Enrollment No./Seat No.:

GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering - SEMESTER - VI EXAMINATION - WINTER 2025

Subject Code: 2161001 **Date: 02-12-2025**

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)**	Define: Noise temperature, Noise bandwidth, Noise figure	**03**
	(b)	With the help of neat diagram explain the transmitter and receiver of Pulse Code Modulation	**04**
	(c)	Define cumulative Distribution Function (CDF). What are the important properties of CDF? State and prove them.	**07**
Q.2	**(a)**	Explain Nyquist criteria of sampling. State the importance of Nyquist criteria in communication.	**03**
	(b)	Explain chebyshev's inequality	**04**
	(c)	Explain ASK modulation. Explain non coherent detection method of ASK demodulation.	**07**
		OR	
	(c)	Explain non-coherent detection of Frequency-Shift keying signal with necessary equations.	**07**
Q.3	**(a)**	Define entropy, coding efficiency, Redundancy.	**03**
	(b)	What is quantization and also state the difference between uniform and non-uniform quantization?	**04**
	(c)	Write a short note on Delta Modulation.	**07**
		OR	
	(a)	Explain T1 Carrier System.	**03**
	(b)	Explain how error free communication can be achieve over noisy channel?	**04**
	(c)	Derive the Channel Capacity of Discrete Memory less Channel	**07**
Q.4	**(a)**	Find the mean, the mean square and the Variance of the general Gaussian random variable.	**03**
	(b)	What is Eye diagram? Explain the significance of it in the pulse detection technique.	**04**
	(c)	Write a short note in Central limit theorem	**07**

OR

	(a)	Explain regenerative repeater.	**03**
	(b)	What is PDF? Write the properties of PDF.	**04**
	(c)	Explain Scrambler and Descrambler in a detail with diagram.	**07**
Q.5	**(a)**	Define the following terms: (i) Code rate, (ii) Hamming Bound, (iii) Systematic code	**03**
	(b)	Discuss the MSK modulation technique and list the merits of it.	**04**
	(c)	Explain Quadrature Phase Sift Keying (QPSK) modulation	**07**

OR

	(a)	Differentiate Coherent and Non coherent detection technique in detail with example.	**03**
	(b)	Differentiate between Convolutional codes and Block codes.	**04**
	(c)	Construct a systematic (7,4) cyclic code using a generator polynomial g (x) = $x^3 + x^2 + 1$. Consider data vector d=1010.	**07**

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