Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI EXAMINATION – SUMMER 2025

Subject Code:2161001 Date:20-05-2025

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.**
4. **Simple and non-programmable scientific calculators are allowed.**

			MARKS
Q.1	**(a)**	Draw and Explain the basic building blocks of Digital communication.	**03**
	(b)	Define CDF. What are the important properties of CDF? State and prove them.	**04**
	(c)	State and prove sampling theorem.	**07**
Q.2	**(a)**	Explain T1 Carrier System.	**03**
	(b)	Difference between DPCM and ADPCM.	**04**
	(c)	Explain quantization in detail. Derive equation for quantization error.	**07**
		OR	
	(c)	Derive the expression of Power Spectral Density (PSD) of On-Off signaling technique. Sketch the PSD of On-Off signaling technique.	**07**
Q.3	**(a)**	Define the terms Mean, Central moment and Variance of a Random Variable.	**03**
	(b)	Explain chebyshev's inequality.	**04**
	(c)	Explain Scrambler and Descrambler in a detail with diagram.	**07**
		OR	
Q.3	**(a)**	What do you mean by line coding? Explain unipolar NRZ and Bipolar RZ.	**03**
	(b)	Explain regenerative repeater in a detail with each sub-block.	**04**
	(c)	State and Prove Central limit theorem with necessary equation and waveform.	**07**
Q.4	**(a)**	Differentiate coherent and non-coherent detection technique in detail with explain.	**03**
	(b)	Define and explain : (i) Noise Figure (ii) Noise temperature.	**04**
	(c)	What is QAM ? State the merits of QAM. Among the following QAM scheme which has more probability of error for same signal to noise ration, explain with proper insight. 8-QAM, 16- QAM, 32-QAM and 64-QAM.	**07**
		OR	
Q.4	**(a)**	Draw the waveform for the given sequence 1 1 0 1 0 0 1 With following modulation technique : (i) ASK (ii) FSK (iii) PSK	**03**
	(b)	With diagram explain the principle of BPSK.	**04**
	(c)	Explain non-coherent detection of frequency-shift keying signal with necessary equations.	**07**
Q.5	**(a)**	Explain Convolution code decoding process with examples.	**03**
	(b)	Explain hamming bound condition with mathematical background.	**04**
	(c)	Derive the Channel Capacity of Discrete Memory less Channel.	**07**

OR

Q.5	**(a)**	Entropy is maximum for equiprobable messages. Justify the statement.	**03**
	(b)	Derive the relationship between channel capacity and signal to noise ratio in the light of shannon's theorem.	**04**
	(c)	For a (7,4) cyclic code using the generator polynomial $g(x) = x^3 + x + 1$, (i) Construct the decoding table, (ii) If the received word is **1101100**, determine the transmitted data word.	**07**

]************