Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–V EXAMINATION – WINTER 2025

Subject Code:3150912 Date:21-11-2025

Subject Name:Signals and Systems

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)**	Explain the test signals.	**03**
	(b)	Sketch signal x(t) = u(t+2) – u(t-2) + u(t+1) – u(t-1).	**04**
	(c)	Explain Even and Odd signals with examples.	**07**
Q.2	**(a)**	Explain methods of representation of signals.	**03**
	(b)	If signal cos 10 t + sin 20 t is periodic or not? If it is periodic then find its fundamental period.	**04**
	(c)	Classified different types of system with examples.	**07**
		OR	
	(c)	Determine whether the system is (i) Linear (ii) causal, (iii)time-invariant(iv) static .**$y(n)= a^n u(n)$**	**07**
Q.3	**(a)**	State and prove the Sampling Theorem.	**03**
	(b)	Explain the initial value and final value theorem.	**04**
	(c)	Find the convolution of the following sequences: **$X(n)=3\ \delta(n+1)-2\delta(n)+\ \delta(n-1)+4\delta(n-2)$** **$h(n)= 2\ \delta(n-1)+5\delta(n-2)+3\ \delta(n-3)$**	**07**
		OR	
Q.3	**(a)**	Explain Aliasing and its effects and how to remove it	**03**
	(b)	Determine the Nyquist sampling rate and Nyquist sampling interval for $x(t)=2\text{sinc}(100\pi t)$.	**04**
	(c)	Define convolution. Write properties of Convolution.	**07**
Q.4	**(a)**	State and prove Time shifting and Linearity properties of continuous time Fourier transform.	**03**
	(b)	Write modulation property of Fourier Transform. Use frequency differentiation property to find the Fourier Transform of $X(t)=t\ e^{-at}\ u(t)$.	**04**
	(c)	Explain Time variant and Time invariant System with examples.	**07**
		OR	
Q.4	**(a)**	Explain with linearity and time-shifting properties of the Fourier series.	**03**
	(b)	Write a short note on Arduino and Interfacing of the sensors	**04**
	(c)	Find Fourier Series representation of half wave rectified sine wave.	**07**
Q.5	**(a)**	Find the Z-Transform of unit Step Signal.	**03**
	(b)	List the properties of the region of convergence (ROC) for the z-transform.	**04**
	(c)	Write a short note on the Internet of Things	**07**
		OR	
Q.5	**(a)**	Write Differentiation in Z-domain property of z-transform.	**03**
	(b)	Determine the inverse Z-transform of the following X(z) $X(Z)=\frac{z}{2z^2-3z+1},\ \lvert z\rvert<\frac{1}{2}.$	**04**
	(c)	Explain Types of sensors.	**07**