Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V (NEW) EXAMINATION – SUMMER 2024

Subject Code: 3150912 Date:21-05-2024

Subject Name: Signals and Systems

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 Periodic and Non Periodic signal	**03**
	(b)	Explain the classification of signals	**04**
	(c)	Draw below signals 1.u(-t) 2.-4r(t) 3.u(t+4) 4.4cos(wt+$\pi/2$)	**07**
Q.2	**(a)**	Draw and explain the discrete type of test signals.	**03**
	(b)	If signal cos(13πt)+ 2sin(4πt) is periodic or not? If it is periodic then find its fundamental period.	**04**
	(c)	Define the System and classified it.	**07**
		OR	
	(c)	Determine whether the system is (i) Linear (ii) causal, (iii)time -invariant(iv) stable .**y(n)=nx(n)**	**07**
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)=2sinc(100πt).	**04**
	(c)	Find the convolution of the following sequences: **X(n)=3 δ(n+1)-2δ(n)+ δ(n-1)+4δ(n-2)** **h(n)= 2 δ(n-1)+5δ(n-2)+3 δ(n-3)**	**07**
		OR	
Q.3	**(a)**	State and prove Sampling Theorem.	**03**
	(b)	Compute convolution: y(n)=x(n)*h(n), x(n)={1,1, 0 ,1,1}.0 is mid point,h(n)={1,-2,-3, 4}4 is mid point.	**04**
	(c)	Define convolution and explain the initial value and final value theorem.	**07**
Q.4	**(a)**	State and prove Time shifting and Duality 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)	Give relation between Fourier transform and Laplace transform.	**07**
		OR	
Q.4	**(a)**	Define Z-transform. Explain region of convergence.	**03**
	(b)	Explain the trigonometric Fourier series.	**04**
	(c)	Find Fourier Series representation for the square wave.	**07**

Q.5	**(a)**	Explain Fourier series with any two properties	**03**
	(b)	Find the Z-transform of the unit step signals	**04**
	(c)	Explain the Types of sensors.	**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)	**04**

$$X(Z) = \frac{z}{2z^2 - 3z + 1}, \left|z\right| < \frac{1}{2}.$$

	(c)	Write a short note on Arduino.	**07**

****