Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V EXAMINATION – SUMMER 2025

Subject Code:3150912 Date:17-05-2025

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 Energy and power signal	**03**
	(b)	Explain the classification of signals	**04**
	(c)	Classified different types of system with examples.	**07**
Q.2	**(a)**	Explain methods of representation of signals.	**03**
	(b)	If signal $\cos(13\pi t)+ 2\sin(4\pi t)$ is periodic or not? If it is periodic then find its fundamental period.	**04**
	(c)	Explain odd and even signals with diagram.	**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 $x(t)=2\text{sinc}(100\pi t)$.	**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)	find the Fourier Transform of $x(t) = e^{-2t} \cos 5t\, u(t)$	**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 of full wave rectified sine wave.	**07**
Q.5	**(a)**	Explain Fourier series with any two properties	**03**
	(b)	Find the Z-transform of the following signals. 1. $x[n]$ = u(-n-2) 2. $x[n] = a^{n-2}u[n-2]$	**04**
	(c)	Write a short note on Arduino and Interfacing of the sensors and actuators with Arduino.	**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) Explain the Internet of Things **07**

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