Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER– V EXAMINATION – SUMMER 2026

Subject Code:3153205 Date:25-05-2026

Subject Name:Signal 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)**	Classify the various types of signals	**3**
	(b)	Define signal. What do you mean by energy and power signal?	**4**
	(c)	What do you mean by periodic and non-periodic discrete time signals? State and prove the condition of periodicity of a discrete time signals.	**7**
Q.2	**(a)**	Define the term step response. How it can be expressed in terms of impulse response for CT system?	**3**
	(b)	Explain the associative, commutative, distributive, and time-shift property of discrete time convolution system.	**4**
	(c)	Compute the impulse response of a system described by the 1st order equation: $4\frac{d}{dt}y(t)+3y(t)=x(t)$	**7**
		OR	
	(c)	Perform convolution between $x(t)=u(t)$ and $h(t)=e^{-t}u(t)$ for $t \geq 0$.	**7**
Q.3	**(a)**	What do you mean by frequency analysis of a signal? Define phase and line spectrum.	**3**
	(b)	Define Fourier transform and explain any two properties of it.	**4**
	(c)	State and prove the following properties of Fourier series: i. Time Shifting ii. Time Scaling	**7**
		OR	
	(a)	Find the Fourier transform of the signal $x(t)=\frac{1}{a^2+t^2}$.	**3**
	(b)	What do you mean by frequency shifting property of Fourier Transform? Prove it.	**4**
	(c)	Define the continuous time Fourier transform. State and prove duality property of continuous time Fourier transform.	**7**
Q.4	**(a)**	Explain region of convergence for z-transform.	**3**
	(b)	Compute the inverse z transform of $X(z)=\frac{z^2}{(z-1)(z-0.2)}; ROC \mid z \mid > 1$	**4**
	(c)	Define z-transform. State and prove time shifting and time reversal properties of z-transform.	**7**
		OR	
	(a)	Explain initial and final value theorem.	**3**

(b) Find the transfer function and impulse response of the system described by the difference equation $y(n) = \frac{1}{5} y(n-1) + x(n)$. **4**

(c) If the impulse response of the system is $h(n)[(0.5)^n + n(0.2)^n]u(n)$, compute the transfer function and obtain the difference equation of the system. **7**

Q.5 **(a)** Define low and band pass signal. **3**

(b) Explain sampling and quantization. **4**

(c) State and prove sampling theorem. **7**

OR

(a) What do you mean by interpolation? Mention the different types of interpolation. **3**

(b) Explain the process of recovering the original signal from its samples. **4**

(c) Define aliasing. Mention the effects of aliasing. How do we remove aliasing using sampling frequency. **7**

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