Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V (NEW) EXAMINATION – WINTER 2023

Subject Code:3150912 Date:11-12-2023

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)**	Define a periodic continuous time and discrete time signal.	**03**
	(b)	Give examples of continuous time and discrete time causal systems.	**04**
	(c)	(i) State whether the following system is linear and time-invariant? $y(n)=u[n]^2$ (ii) State whether the following system is causal, stable and memoryless ? $y[n]=nu[n]$	**07**
Q.2	**(a)**	Define energy signal and power signal. Give an example of each type.	**03**
	(b)	Write the equations for coefficients C_n and C_{-n} of complex exponential Fourier series.	**04**
	(c)	Obtain the complex exponential Fourier series expansion of the signal $x(t)=2+3\cos 2\pi t +4 \sin 3\pi t$.	**07**
		OR	
	(c)	Find the Fourier transform of the signum function sgn(t).	**07**
Q.3	**(a)**	State and prove time shifting property of Fourier transform.	**03**
	(b)	Find the Laplace transform of $x(t)= tu(t)$.	**04**
	(c)	Find the inverse Laplace transform of $F(s)=(2s-1)/(s^2+2s+1)$	**07**
		OR	
Q.3	**(a)**	State and prove time scaling property of Fourier transform.	**03**
	(b)	Find Fourier transform of $x(t)= 10 \sin \omega_0 t$.	**04**
	(c)	Find the Fourier transform of a rectangular pulse with amplitude A and width T.	**07**
Q.4	**(a)**	Define Z-transform and its ROC.	**03**
	(b)	State the properties of ROC of Z-transform.	**04**
	(c)	Find the Z-transform of $\sin \omega n\, u(n)$.	**07**
		OR	
Q.4	**(a)**	State any three properties of Z-transform.	**03**
	(b)	Find the Z-transform of $0.5^n u(n) + 0.33^n u(n)$	**04**
	(c)	Find the inverse Z-transform of $X(z)= z/(3z^2-4z+1)$ for ROC $\|z\|>1$.	**07**
Q.5	**(a)**	List the types of sensors.	**03**
	(b)	State and prove the sampling theorem.	**04**
	(c)	Give an example of Arduino based minor project.	**07**
		OR	
Q.5	**(a)**	List the types of actuators.	**03**
	(b)	Draw the spectra of sampled signal. Explain aliasing.	**04**
	(c)	Explain interfacing of sensors and actuators with Arduino.	**07**