

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: $X(n) = 3\delta(n+1) - 2\delta(n) + \delta(n-1) + 4\delta(n-2)$ $h(n) = 2\delta(n-1) + 5\delta(n-2) + 3\delta(n-3)$	07
	OR	
Q.3	(a) 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 $X(t) = te^{-at}u(t)$.	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.	04
	1. $x[n] = u(-n-2)$	
	2. $x[n] = a^{n-2}u[n-2]$	
	(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**

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

- (c) Explain the Internet of Things **07**

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	07
	1. $u(-t)$	
	2. $-4r(t)$	
	3. $u(t+4)$	
	4. $4\cos(\omega t + \pi/2)$	
Q.2	(a) Draw and explain the discrete type of test 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) 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 $x(t) = 2\text{sinc}(100\pi t)$.	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) 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**

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

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

- (c) Explain the any application of modulation for communication in signal and system. **07**

OR

- Q.4** (a) What is Aliasing? **03**
(b) What are the effects of under sampling of a signal? **04**
(c) Explain in detail of mathematical model for reconstruction. **07**

- Q.5** (a) What is IOT? Draw the block diagram of any application of an IOT based system. **03**
(b) Explain with diagram any four sensors which used in IOT application **04**
(c) Explain with circuit diagram of any application based on Arduino with sensor & actuators. **07**

OR

- Q.5** (a) Explain Input and output pins of Arduino. **03**
(b) Explain the different types of Actuators. **04**
(c) Explain with the circuit diagram of temperature measurement 0 to 100 °C using LM35 with 16x2 LCD display using Arduino. Also write the program. **07**

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER-V(NEW) EXAMINATION – SUMMER 2022

Subject Code:3150912**Date:07/06/2022****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 odd and even signals with diagram.	03
	(b) Define the following: Energy signal, Causal System, Analog signal, Periodic signal.	04
	(c) Explain the Standard / Elementary signals in signal processing in continuous and discrete time.	07
Q.2	(a) A 100 Hz sinusoid $x(t)$ is sampled at 240 Hz. Has aliasing occurred? Also state the minimum sampling frequency.	03
	(b) What is a system? Explain different types of system in brief.	04
	(c) Determine whether the following system given as $y(t) = 10x(t) + 5$ is static, causal, linear, time invariant and stable.	07
	OR	
	(c) For LTI system with unit impulse response $h(t) = e^{-2t} u(t)$, determine output to the input $x(t) = e^{-t} u(t)$.	07
Q.3	(a) Find Z transform for sequence $x(n) = \{1, 2, 4, 5, 0, 7\}$ and specify ROC.	03
	(b) Explain trigonometric fourier series with all equations.	04
	(c) Sketch the following signals if $x(n) = \{1, 1, 1, 1, 1, 1/2\}$	07
	$\begin{array}{c} \uparrow \\ 1. \ x(n-4) \ 2. \ x(n).u(2-n) \ 3. \ x(n-1) + \delta(n-3) \end{array}$	
	OR	
Q.3	(a) State and prove the time shifting property of Fourier transform.	03
	(b) Find Fourier transform of unit step function.	04
	(c) Find inverse Z transform of $X(z) = 1 / (1 - 1.5z^{-1} + 0.5z^{-2})$ for 1. ROC: $ z > 1$, 2. ROC: $ z < 0.5$.	07
Q.4	(a) Find the energy or power of the signal $x(n) = u(n)$.	03
	(b) Explain any two properties of convolution sum.	04
	(c) Find the linear convolution of : $x(n) = \{1, 1, 1, 1\}$ and $h(n) = \{2, 2\}$	07
	$\begin{array}{c} \uparrow \qquad \qquad \qquad \uparrow \\ \text{using basic convolution equation or graphical method.} \end{array}$	
	OR	
Q.4	(a) Define Laplace transform and prove its linearity property.	03
	(b) Obtain Fourier transform of a rectangular pulse given as : $x(t) = A \text{ rect}(t/T)$.	04
	(c) The difference equation of system is given as below: $y(n) = 0.5y(n-1) + x(n)$. Determine the system function and the impulse response $h(n)$ of the system.	07

- Q.5** (a) Find Z transform of $x(n) = (1/3)^n u(n)$ and also sketch its ROC. **03**
(b) State and prove any two properties of Z transform. **04**
(c) Give equation for Z transform. What is ROC for Z transform? State the properties of ROC. **07**

OR

- Q.5** (a) State and explain sampling theorem with necessary equations. **03**
(b) Explain any three sensors used in Internet of Things. **04**
(c) Find Z transform of $x(n) = \cos(\omega n) u(n)$ **07**
