Enrollment No./Seat No.: _____

GUJARAT TECHNOLOGICAL UNIVERSITY
Bachelor of Engineering - SEMESTER - III EXAMINATION - WINTER 2025

Subject Code: BE03000261   **Date: 22-12-2025**

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)**	Explain Energy and Power signals.	**03**
	(b)	Differentiate between continuous-time and discrete-time signals.	**04**
	(c)	Explain the Convolution Sum and the Convolution Integral.	**07**
Q.2	**(a)**	Determine the following system described by $y[n] = x[-n]$ is memory less, causal, linear and time-invariance?	**03**
	(b)	Determine the convolution for $x[n] = \{1, 2, 1\}$ and $h[n] = \{1, -1, 2\}$	**04**
	(c)	Compare the Fourier Series representation of continuous-time and discrete-time periodic signals.	**07**

OR

	(c)	Derive the expression for Fourier coefficients of a square wave of period 2π.	**07**
Q.3	**(a)**	Describe the relationship from Fourier seires to Fourier transform with necessary equations.	**03**
	(b)	Explain how the response of an LTI system to a complex exponential input helps in analyzing periodic signals using Fourier Series.	**04**
	(c)	Explain how convolution in the time domain corresponds to multiplication in the frequency domain in CTFT	**07**

OR

	(a)	Discuss the properties of Continuous-Time Fourier Series (CTFS). Mention any three with examples.	**03**
	(b)	Discuss the properties of Discrete-Time Fourier Series (DTFS). Mention any four with examples.	**04**
	(c)	Find the output using the convolution property of below two inputs $x_1(t) = e^{-t}u(t)$ $x_2(t) = e^{-2t}u(t)$	**07**

Q.4 (a) Find the Fourier Transform of
$$x(t) = e^{-at}u(t)$$
03

(b) Explain the Discrete-Time Fourier Transform (DTFT) with its mathematical expression.
04

(c) Determine the magnitude and phase response of the DTFT of
$$x[n] = a^n u[n]$$
07

OR

(a) State and prove any two properties of CTFT.
03

(b) Find DTFT of the sequence x (n) = {1, 0, 4, 2}
04

(c) State and explain any four properties of DTFT with suitable mathematical expressions
07

Q.5 (a) Determine the Laplace transform of
$$x(t) = e^{at}u(t)$$
and depict the ROC and the locations of poles and zeros in the s -plane.
03

(b) Define ROC for z-transform. List the property of ROC.
04

(c) Determine the system function H(z) for the system described by the difference equation
$$y(n) - \frac{3}{4}y(n-1) + \frac{1}{8}y(n-2) = x(n)$$
07

OR

(a) Determine the Laplace transform and ROC of the signal
$$x(t) = u(t-5)$$
03

(b) Find the Z-transform of the the signal
$$x[n] = a^n u[n]$$
04

(c) Explain the properties of z transform
07

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