

GUJARAT TECHNOLOGICAL UNIVERSITY**BE- SEMESTER-V EXAMINATION – WINTER 2025****Subject Code:3153205****Date:19-11-2025****Subject Name:Signal 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 Unit Step Signal, Unit Impulse Signal and Unit Ramp Signal	03
	(b) Explain the classification of signals.	04
	(c) Explain properties of LTI systems	07
Q.2	(a) Give the convolution sum and integral formulas.	03
	(b) Explain relation between Laplace Transform and Fourier Transform	04
	(c) Determine the convolution of two sequences $x(n) = \{4,5,6\}$ and $h(n) = \{4,4,3,2\}$	07
	OR	
	(c) Determine whether the system is (I) Linear (II) causal (III) time invariant (IV) stable and (V) memoryless	07
Q.3	(a) State and prove time shifting property of Fourier transform	03
	(b) Find the Fourier transform of $\delta[n - n_0]$	04
	(c) Find the frequency response $H(e^{j\omega})$ of the linear time invariant system whose input and output satisfy the difference equation	07
	$y[n] - \frac{1}{2}y[n-1] = x[n] + 2x[n-1] + x[n-2]$	
	OR	
Q.3	(a) State and prove linearity property of Fourier transform.	03
	(b) Prove convolution property of Fourier transform.	04
	(c) Find the Fourier transform of the sequence	07
	$x[n] = a^n u[n-5]$	
Q.4	(a) Define Z-transform. Explain region of convergence.	03
	(b) State the properties of ROC of Z-transform.	04
	(c) Find the z-transform of a causal exponential signal	07
	$x[n] = a^n u[n]$	
	Also discuss ROC of given signal	
	OR	
Q.4	(a) Determine the z-transform of following finite duration sequence	03
	$x[n] = \{1,2,3,4\}$	
	(b) State any two properties of Z-transform.	04
	(c) Determine the z transform, the ROC and the locations of poles and zeros of $X(z)$ for the following signal	07
	$x[n] = \left(\frac{1}{2}\right)^n u[n] + \left(-\frac{1}{3}\right)^n u[n]$	

Q.5	(a)	What is Aliasing?	03
	(b)	Determine the Nyquist rate for signal $x(t) = \sin(200\pi t)$	04
	(c)	State and prove Sampling Theorem	07
OR			
Q.5	(a)	What are the effects of under and over sampling of a signal?	03
	(b)	What is zero-order hold in sampling?	04
	(c)	Explain in detail of mathematical model for reconstruction of a signal.	07
