Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–V (NEW) EXAMINATION – WINTER 2020

Subject Code:3150912 Date:01/02/2021

Subject Name:Signals and Systems

Time:10:30 AM TO 12:30 PM Total Marks: 56

Instructions:

1. **Attempt any FOUR questions out of EIGHT questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

			Marks
Q.1	**(a)**	Compare Analog Signal and Digital Signal	**03**
	(b)	Differentiate between continuous and discrete time signal.	**04**
	(c)	Explain with Example following properties of system. (1) Linearity (2) Homogeneity (3) Additivity (4) Casuality (5) Shift invariance (6) Stability (7) Realizability	**07**
Q.2	**(a)**	Determine the energy and power of a unit step signal.	**03**
	(b)	State and prove the frequency differentiation property of Fourier transform.	**04**
	(c)	Define Laplace transform. Prove linearity property for Laplace transform. State how ROC of Laplace transform is useful in defining stability of systems.	**07**
Q.3	**(a)**	Obtain the DFT of unit impulse δ(n)	**03**
	(b)	Prove the duality or symmetry property of fourier transform.	**04**
	(c)	Find the fourier transform of the periodic signal $x(t)=\cos(2\pi f_0 t)\, u(t)$	**07**
Q.4	**(a)**	State and prove a condition for a discrete time LTI system to be invertible.	**03**
	(b)	State and prove the time scaling property of Laplace transform.	**04**
	(c)	Find the convolution of two signals $X_1(t)$ and $X_2(t)$ $X`(t)= e^{-4t}u(t)$ $X2(t)= u(t-4)$	**07**
Q.5	**(a)**	State the condition for existence of Fourier integral.	**03**
	(b)	Prove that when a periodic signal is time shifted, then the magnitude of its fourier series coefficient remains unchanged. (|an|=|bn|)	**04**
	(c)	Determine the homogeneous solution of the system described by: $y(n) - 3y(n-1) - 4y(n-2) = x(n)$	**07**
Q.6	**(a)**	State and prove the initial value theorem.	**03**
	(b)	State and prove the Final value theorem.	**04**
	(c)	Explain the trigonometric fourier series with suitable example.	**07**
Q.7	**(a)**	Explain discrete Fourier transform and enlist its features.	**03**
	(b)	Define the region of convergence with respect to z-transform.	**04**
	(c)	Define: The Z transform. State and prove Time shifting and Time reversal properties of Z transform	**07**
Q.8	**(a)**	Determine the z-transform of following finite duration	**03**

sequence X(n)={1,2,4,5,0, 7}

(b) Calculate the DFT of the sequence $x(n) = \{1,1,0,0\}$. Verify your answer with IDFT. **04**

(c) Determine if the following systems described by **07**

i. y(t) = sin[x(t+2)];

ii. y(n)=x[2-n]

are memoryless, causal, linear, time invariant, stable