

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.	07
(1) Linearity (2) Homogeneity (3) Additivity	
(4) Casuality (5) Shift invariance (6) Stability	
(7) Realizability	
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 $\delta(n)$	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 $X_2(t)$ $X_1(t)=e^{-4t}u(t)$ $X_2(t)=u(t-4)$	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. ($ a_n = b_n $)	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**
- $y(t) = \sin[x(t+2)]$;
 - $y(n)=x[2-n]$
- are memoryless, causal, linear, time invariant, stable

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