GUJARAT TECHNOLOGICAL UNIVERSITY

BE – SEMESTER- V EXAMINATION-SUMMER 2023

Subject Code: 3150912 Date: 27/06/2023

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 with Example following properties of system. (1) Linearity (2) Homogeneity (3) Shift invariance	03	
	(b)	Define energy for continuous-time and discrete-time signals.	04	
	(c)	Write the properties of convolution and explain them with suitable example.	07	
Q.2	(a)	Give expression of trigonometric Fourier Series. Define coefficients of DC, fundamental and harmonics.	03	
	(b)	State and prove a condition for a discrete time LTI system to be	04	
		invertible.		
	(c)	Perform Linear convolution of following:	07	
		1. $x(n) = \{1, 1, 0, 1, 1\} & h(n) = \{1, -2, -3, 4\}$		
		2. $x(n) = \{1, 2, 3, 1\} & h(n) = \{1, 2, 1, -1\}$		
		3. $x(n) = \{1, 2, 1, -1\} & h(n) = \{1, 2, -3, 4\}$		
OR				
	(c)	An LTI system is described by the difference equation	07	

- (c) An LTI system is described by the difference equation y(n) = x(n) + 0.81x(n-1) 0.81x(n-2) 0.45y(n-2) Determine transfer function of the system. Draw pole zero plot and assess stability.
- Q.3 (a) Define Fourier transform for continuous-time signal.
 - (b) Find the Fourier transform of cosine wave $\cos \omega_0 t$. Draw its magnitude spectrum.
 - (c) State and explain each properties of ROC of z-transform. 07

OR

- Q.3 (a) Give relationship between Laplace transform and Fourier transform. 03
 - (b) Using properties of Z transform, compute Z transform for following signals. (1) x(n)=u(-n), (2) x(n)=u(-n-2)
 - (c) State and prove time shifting and time-differentiation properties of Laplace transform. 07
- **Q.4** (a) Define the terms (1) Zero-order hold (2) First-order hold (3) Ideal interpolation.
 - (b) Distinguish continuous time systems and discrete time systems 04

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