Seat No.: _____   Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–V (NEW) EXAMINATION – WINTER 2022

Subject Code:3150912   **Date:09-01-2023**
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)**	Find whether the given signals are periodic or not? If yes, give its fundamental period. (i) $x(t) = 3 \sin 200\pi t + 4 \cos 100t$ (ii) $x(n) = e^{j(\pi/2)n}$	**03**
	(b)	Check whether the signal $x(t) = 2\cos(100\pi t) + 5\sin(50t)$ is periodic or not.	**04**
	(c)	Determine the convolution sum of two sequences using graphical method $x(n) = \{1, 4, 3, 2\}$; $h(n) = \{1, 3, 2, 1\}$ $\qquad\qquad\uparrow\qquad\qquad\qquad\uparrow$	**07**
Q.2	**(a)**	Determine the energy and power of a signal $x(t) = u(t)$.	**03**
	(b)	List and prove any two properties of convolution sum.	**04**
	(c)	Sketch signal $x(t) = u(t+2) - u(t-2) + u(t+1) - u(t-1)$. Also sketch (i) $x(2t)$ (ii) $x(1-t)$ (iii) $x(t) \cdot u(t)$.	**07**

OR

	(c)	Check whether the system described by the equation $y(t)=10x(t)+5$ is linear, static, time invariant, causal and stable .	**07**
Q.3	**(a)**	State the linearity and time shifting property of Fourier transform.	**03**
	(b)	Prove convolution property of Fourier transform.	**04**
	(c)	Find inverse Fourier transform of $$X(\omega) = \frac{2j\omega}{(2+j\omega)^2}$$	**07**

OR

Q.3	**(a)**	Find the Fourier transform of the signal $x(t) = e^{-at\,u(t)}$.	**03**
	(b)	Explain the Differentiation property of Z-Transform.	**04**
	(c)	Explain working of any system based on Arduino.	**07**
Q.4	**(a)**	Give the convolution sum and integral formulas.	**03**
	(b)	State and prove the time shifting property of the Z-transform.	**04**
	(c)	Define ROC and explain the property of ROC.	**07**

OR

Q.4	**(a)**	Find DTFT of the sequence $x(n) = \{1, 0, 4, 2\}$.	**03**
	(b)	Determine the Z – Transform & ROC of the following sequence $X(n) = (3)^n u(n) - (2)^n u(-n-1)$.	**04**
	(c)	Solve the difference equation $y(n) - 0.5y(n-1) = \delta(n)$ using Z-transform.	**07**

Q.5 (a) Explain the reconstruction of a signal from its samples. **03**

(b) Find the DFT of the sequence x (n) = {1, 1, -2, -2} . **04**

(c) State & Prove Sampling Theorem. **07**

OR

Q.5 (a) What is zero-order hold in sampling? **03**

(b) What are the effects of under sampling of a signal? **04**

(c) Describe various types of sensors used for IoT applications. **07**

.

****