# GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–IV (NEW) EXAMINATION – WINTER 2023

Subject Code:2141005   **Date:31-01-2024**

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.

Q.1	**(a)**	Define continuous and discrete signals..	**03**
	(b)	Find the fundamental time period of the signal: $x(t) = 3\sin(200\pi t)$	**04**
	(c)	Find the even and odd components of the signal: $x(t) = 1 + 2t + 6t^2 + 4t^5 + 4t^6$ Explain the classification of signals.	**07**
Q.2	**(a)**	Explain the classification of systems.	**03**
	(b)	Explain the properties of Linear Time Invariant Systems.	**04**
	(c)	Represent the following signals graphically. (1) $x(n) = (1,0,1,0\overset{\uparrow}{1},0)$ (2) $x(t) = u(t+1)$	**07**

OR

	(c)	Find the convolution of the following signals. $x_1(n) = (1,0,3,4,3)$ and $x_2(n) = (0,1,3,1,8)$	**07**
Q.3	**(a)**	Derive the relationship between fourier and laplace transform.	**03**
	(b)	Explain the properties of convolution.	**04**
	(c)	Find the Fourier series expansion of the half wave rectified sine wave as shown in figure below:	**07**
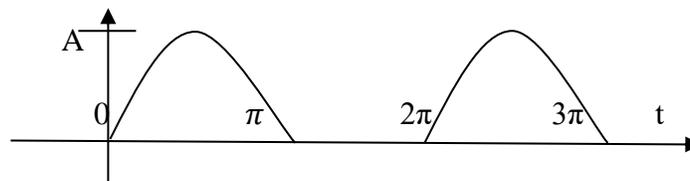
OR

Q. 3	**(a)**	Find the step response of the system whose impulse response is given as $h(t) = u(t+1) - u(t-1)$	**03**
	(b)	Explain the properties of Fourier Transform.	**04**
	(c)	Obtain the Fourier Transform of following signals: (1) $x(t) = e^{at}u(t)$ (2) $x(t) = 1$	**07**
Q.4	**(a)**	.Explain the initial and final value theorem with respect to z-transform	**03**
	(b)	Determine the constants of trigonometric fourier series.	**04**
	(c)	Determine if the following system described by y[n]=x[n-2] is memory-less , causal, linear, time invariant.	**07**

OR

Q.4   **(a)**   Define z-transform.   **03**
         (b)   Explain the properties of z-transform.   **04**
         (c)   Define Region of convergence. Explain the properties of RoC.   **07**

Q.5   **(a)**   Explain the case study of signals in communication field.   **03**
         (b)   Describe the conditions of existence of fourier transform.   **04**
         (c)   Determine the z-transform of following signals.   **07**

$$(1) x(n) = \frac{2}{5} u(n+2)$$

$$(2) x(n) = (0.6)^n u(n) + (0.9)^n u(n)$$

OR

Q.5   **(a)**   Determine the inverse z-transform by power series expansion: **03**

$$X(z) = \frac{1}{1 - az^{-1}}$$

         (b)   Determine the inverse z-transform by partial fraction expansion method: **04**

$$X(z) = \frac{(z+2)}{2z^2 - 7z + 3}$$

         (c)   Explain the applications of digital signals in biomedical field.   **07**

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