Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V(NEW) EXAMINATION – SUMMER 2022

Subject Code:3150912 Date:07/06/2022

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 odd and even signals with diagram.	**03**
	(b)	Define the following: Energy signal, Causal System, Analog signal, Periodic signal.	**04**
	(c)	Explain the Standard / Elementary signals in signal processing in continuous and discrete time.	**07**
Q.2	**(a)**	A 100 Hz sinusoid x(t) is sampled at 240 Hz. Has aliasing occurred? Also state the minimum sampling frequency.	**03**
	(b)	What is a system? Explain different types of system in brief.	**04**
	(c)	Determine whether the following system given as $y(t)= 10x(t) +5$ is static, causal, linear, time invariant and stable.	**07**
		OR	
	(c)	For LTI system with unit impulse response $h(t)= e^{-2t} u(t)$, determine output to the input $x(t)= e^{-t} u(t)$.	**07**
Q.3	**(a)**	Find Z transform for sequence x(n)={1,2,4,5,0,7} and specify ROC.	**03**
	(b)	Explain trigonometric fourier series with all equations.	**04**
	(c)	Sketch the following signals if x(n)= { 1,1,1,1,1,1/2} ↑ 1. x(n-4) 2. x(n).u(2-n) 3. x(n-1) + δ(n-3)	**07**
		OR	
Q.3	**(a)**	State and prove the time shifting property of Fourier transform.	**03**
	(b)	Find Fourier transform of unit step function.	**04**
	(c)	Find inverse Z transform of $X(z)= 1 / (1-1.5z^{-1}+0.5z^{-2})$ for 1. ROC: $\|z\| >1$, 2. ROC: $\|z\| < 0.5$.	**07**
Q.4	**(a)**	Find the energy or power of the signal x(n)= u(n) .	**03**
	(b)	Explain any two properties of convolution sum.	**04**
	(c)	Find the linear convolution of : x(n)= {1,1,1,1} and h(n)={2,2} ↑ ↑ using basic convolution equation or graphical method.	**07**
		OR	
Q.4	**(a)**	Define Laplace transform and prove its linearity property.	**03**
	(b)	Obtain Fourier transform of a rectangular pulse given as : x(t)= A rect (t/T).	**04**
	(c)	The difference equation of system is given as below: $y(n)= 0.5y(n-1) +x(n)$. Determine the system function and the impulse response h (n) of the system.	**07**

Q.5	**(a)**	Find Z transform of $x(n)= (1/3)^n u(n)$ and also sketch its ROC.	**03**
	(b)	State and prove any two properties of Z transform.	**04**
	(c)	Give equation for Z transform. What is ROC for Z transform? State the properties of ROC.	**07**

OR

Q.5	**(a)**	State and explain sampling theorem with necessary equations.	**03**
	(b)	Explain any three sensors used in Internet of Things.	**04**
	(c)	Find Z transform of $x(n)= \cos(\omega n) u(n)$	**07**

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