Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–V (NEW) EXAMINATION – WINTER 2024

Subject Code:3150912 **Date:02-12-2024**

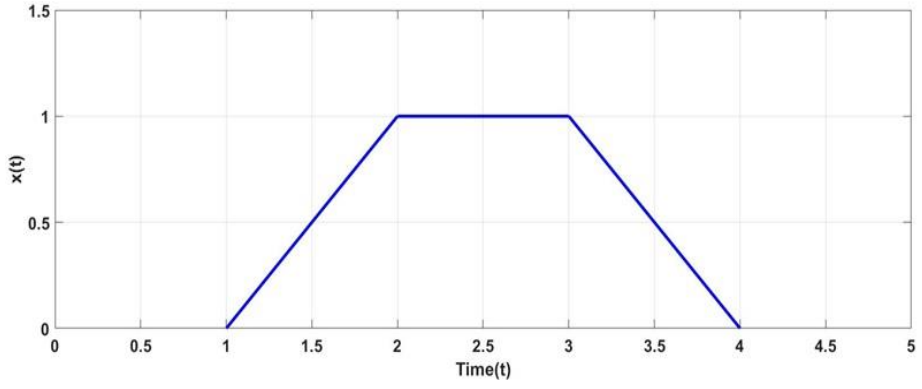
Subject Name:Signals and Systems

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.**

			Marks
Q.1	**(a)**	Check linearity of a system described by $y[n]=x[n]+\frac{1}{2x[n-2]}$	**03**
	(b)	Prove commutative, distributive and associative properties of convolution integral	**04**
	(c)	Convolve $x[n]=\{-1,4,3,2,-2\}$ and $h[n]=\{1,2,-1,1\}$ (arrows under 4 and 2)	**07**
Q.2	**(a)**	Define (i) Periodicity of a signal (ii) Non-causal signals (iii) Even signal and give example of each	**03**
	(b)	Check stability of a system described by $y[n]=x[n]+\frac{1}{2}x[n-1]+\frac{1}{4}x[n-2]$	**04**
	(c)	Given impulse response of the system $h(t)=e^{-2t}u(t)$ .Obtain the output of the system for $x(t)=e^{-4t}[u(t)-u(t-2)]$	**07**
		OR	
	(c)	Given impulse response of the system $h(t)=u(t-3)$ .Obtain the output of the system for $x(t)=u(t+2)$	**07**
Q.3	**(a)**	Check causality of a system described by $y(t)=\int_{-\infty}^{3t} x(\tau)d\tau$	**03**
	(b)	State and prove linearity and convolution property of z- transform	**04**
	(c)	Find Fourier transform of $x[n]=2^n \sin[(\pi/4)n]u[-n]$	**07**
		OR	
Q.3	**(a)**	State Dirichlet conditions for existence of Fourier transform	**03**
	(b)	Obtain the energy of the signal $x(t)$ shown below	**04**



	(c)	Obtain Fourier transform of (a) $x(t) = e^{-2(t-1)}u(t-1)$ (b) $x(t) = \delta(t+2) + \delta(t-2)$	**07**
Q.4	**(a)**	Prove the nonexistence of Fourier series co-efficients a_0 and a_n for a periodic waveform with odd symmetry	**03**
	(b)	Obtain Laplace transform of $x(t) = e^{-at}u(t)$ by direct integration.	**04**
	(c)	Explain zero order hold with its mathematical representation. Write at least three advantages and disadvantages of zero order hold	**07**
		OR	
Q.4	**(a)**	Compare Fourier series and Fourier transform	**03**
	(b)	Obtain Laplace transform of $x(t) = (e^{2t} - 2e^{-t})u(t)$	**04**
	(c)	Explain aliasing by taking a suitable example	**07**
Q.5	**(a)**	Explain signal reconstruction from its sampled form	**03**
	(b)	State and prove the final value theorem	**04**
	(c)	List at least four types of actuators used with Arduino with their application	**07**
		OR	
Q.5	**(a)**	State and explain sampling theorem	**03**
	(b)	State the properties of ROC of z-transform	**04**
	(c)	List at least seven types of sensors used with Arduino with their application in brief	**07**

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