Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV (NEW) EXAMINATION – SUMMER 2024

Subject Code:3141005 Date:18-07-2024

Subject Name: Signal & 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)**	Compare Energy and Power signal.	**03**
	(b)	State & prove a condition for a discrete time LTI system to be stable.	**04**
	(c)	Define R.O.C. of Z-Transform. Write its properties.	**07**
Q.2	**(a)**	Find even and odd parts of $x(t)=u(t)$.	**03**
	(b)	Prove the duality property of the Fourier Transform.	**04**
	(c)	Explain the properties of continuous time and discrete time systems.	**07**
		OR	
	(c)	State & Prove Sampling Theorem.	**07**
Q.3	**(a)**	Find DTFT of the sequence x(n) = {1, 0, 4, 2}.	**03**
	(b)	Explain the Differentiation property of Z-Transform.	**04**
	(c)	Classify signals. Give examples of each.	**07**
		OR	
Q.3	**(a)**	Prove that a DT LTI system is causal if and only if h(n) = 0 for n<0.	**03**
	(b)	Prove Commutative property of Convolution.	**04**
	(c)	Determine Inverse Z- Transform of $X(z) = \frac{1}{(1+z^{-1})(1-z^{-1})^2}$, $ROC: \lvert z\rvert > 1$	**07**
Q.4	**(a)**	Sketch the following waveform: $x(t) = u(t+1)-2u(t)-2u(t-1)$.	**03**
	(b)	Obtain relationship between Laplace and Fourier Transform.	**04**
	(c)	Compute convolution using graphical method: 1.) y(n)=x(n)*h(n), x(n)={1,1, 0 ,3}, h(n)={1,-2,3, -4}	**07**
		OR	
Q.4	**(a)**	Find the Fourier Transform of $x(t) = e^{-5t}u(-t)$.	**03**
	(b)	Bring out difference between DFT and Fourier Transform (FT).	**04**
	(c)	Evaluate continuous time (CT) convolution integral given as: $y(t)=e^{2t}u(t)*u(t+2)$	**07**
Q.5	**(a)**	Determine the z-transform of following finite duration sequence X(n)={1,-3,4,5, 7}	**03**
	(b)	Write a short note on zero order hold with its application.	**04**
	(c)	Compute DFT of the following sequence using its definition. $x[n]=\{0,1,3,2\}$	**07**
		OR	
Q.5	**(a)**	Explain time shifting and periodicity property of Laplace Transform.	**03**
	(b)	Find the Fourier Transform of the periodic signal $x(t)=\sin(2\pi ft)u(t)$	**04**
	(c)	Determine the Inverse Z-Transform of $X(z) = \frac{1+z^{-1}}{1-z^{-1}+0.5z^{-2}}$ Assume that $x[n]$ is causal.	**07**

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