Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV (NEW) EXAMINATION – WINTER 2018

Subject Code:2141005 **Date:14/12/2018**

Subject Name:Signals and Systems

Time: 02:30 PM TO 05:00 PM **Total Marks: 70**

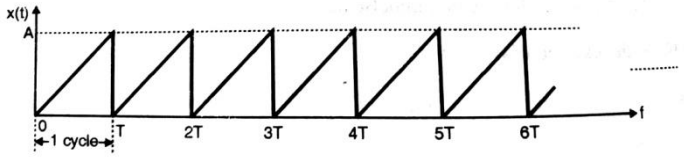
Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

			MARKS
Q.1	**(a)**	Explain Energy and power signal	**03**
	(b)	Explain time shifting and periodicity property of laplace transform.	**04**
	(c)	Write the properties of convolution and explain them with suitable example.	**07**
Q.2	**(a)**	Define system and explain the classification of system.	**03**
	(b)	Consider the following signal X(t)= $Ae^{\alpha t}u(t)$, $\alpha > 0$ Is X(t) an energy signal or power signal as $\alpha \rightarrow 0$ what is the nature of signal?	**04**
	(c)	Compute convolution: 1.) y(n)=x(n)*h(n), x(n)={1,1, 0 ,1,1}, ↑ h(n)={1,-2,-3, 4} ↑ 2.) y(n)=x(n)*h(n), x(n)= h(n)={1,2,-1,3} ↑	**07**
		OR	
	(c)	Explain the properties of continuous time and discrete time systems.	**07**
Q.3	**(a)**	Prove that a DT LTI system is causal if and only if h(n)=0 for n<0.	**03**
	(b)	Impulse response of DT LTI system is given by h(n)=$n\left(\frac{1}{2}\right)^n u(n)$. Determine whether the system is stable or not.	**04**
	(c)	Obtain the convolution integral of X(t)=1 for $-1 \leq t \leq 1$ H(t)=1 for $0 \leq t \leq 2$	**07**
		OR	
Q.3	**(a)**	State and prove a condition for a discrete time LTI system to be stable.	**03**
	(b)	Find and sketch even and odd component of following: $f(x) = \begin{cases} t, & 0 \leq t \leq 1 \\ 2-t, & 1 \leq t \leq 2 \end{cases}$	**04**
	(c)	Find the convolution of two signals $X_1(t)$ and $X_2(t)$ $X_1(t)= e^{-4t}u(t)$ $X_2(t)= u(t-4)$	**07**
Q.4	**(a)**	State and prove the initial value theorem.	**03**

(b) Prove the duality or symmetry property of fourier transform. **04**

(c) Find the fourier series representation for the saw tooth wave depicted in the following figure. **07**



OR

Q.4 **(a)** Write the time scaling property of fourier transform and find the fourier transform of x(t)= $e^{-\alpha t}u(t)$ **03**

(b) Prove that when a periodic signal is time shifted, then the magnitude of its fourier series coefficient remains unchanged. ($|a_n|=|b_n|$) **04**

(c) Find the fourier transform of the periodic signal x(t)=$\cos(2\pi ft)\,u(t)$ **07**

Q.5 **(a)** Obtain the DFT of unit impulse δ(n) **03**

(b) Determine the z-transform of following finite duration sequence X(n)={1,2,4,5,0, 7} **04**

↑

(c) Find the Z-transform of the signal **07**

$$X(n)=\left(-\frac{1}{5}\right)^n u(n)+5\left(\frac{1}{2}\right)^n u(-n-1)$$

OR

Q.5 **(a)** Explain discrete fourier transform and enlist its features. **03**

(b) Define the region of convergence with respect to z-transform. **04**

(c) Find the inverse z-transform of **07**

$$X(z)=\frac{z}{z-1} \quad |z|>1$$

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