

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

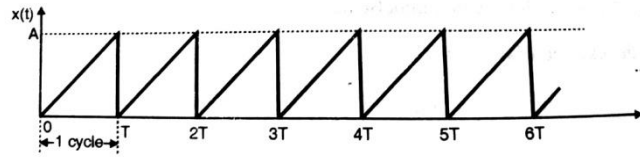
Instructions:

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 $x(t) = e^{-at}u(t)$ **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 $\delta(n)$ **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**

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