

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-IV (NEW) EXAMINATION – WINTER 2021****Subject Code:2141005****Date:05/01/2022****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) Define a causal system and give an example of the same.	03
	(b) Define energy for continuous-time and discrete-time signals.	04
	(c) Determine whether the signal $x(t)=t u(t)$ is a power or an energy signal.	07
Q.2	(a) Plot $u(t)$, $u(n)$ and $u(t)-u(-t)$ signals.	03
	(b) Find the period of the signal $2\cos(10t)-\sin(4t)$.	04
	(c) For the system $y(t)=x(t^2)$, determine whether it is memoryless, stable, causal, linear and time –invariant.	07
OR		
	(c) For the system $y(n)=x(2n)$, determine whether it is static, linear, time invariant, causal and stable.	07
Q.3	(a) Define exponential Fourier series for a periodic signal.	03
	(b) Establish relationship between trigonometric and exponential Fourier series.	04
	(c) Find the trigonometric Fourier series for the periodic square wave.	07
OR		
Q.3	(a) Define Fourier transform for continuous-time signal.	03
	(b) Establish relationship between Fourier series and Fourier transform .	04
	(c) State and prove convolution and modulation properties of Fourier transform.	07
Q.4	(a) Give relationship between Laplace transform and Fourier transform.	03
	(b) Find Laplace transforms for the signals $\delta(t)$ and $u(t)$.	04
	(c) Find the inverse Laplace transform of $X(s)= 4s^2+15s+8$	07
----- (s+2) ² (s-1)		
OR		
Q.4	(a) Define unilateral Laplace transform.	03
	(b) Find Laplace transforms for $\sin(\omega_0 t) u(t)$ and $\cos(\omega_0 t) u(t)$.	04
	(c) State and prove time shifting and time-differentiation properties of Laplace transform.	07
Q.5	(a) Define z-transform and its ROC.	03
	(b) State properties of ROC of z-transform.	04
	(c) Find z-transforms for $x(n)=a^n u(n)$ and $-a^n u(-n-1)$	07
OR		
Q.5	(a) Determine z-transform for $x(n)=nu(n)$.	03
	(b) State and prove linearity and time reversal properties of z-transform.	04
	(c) Find inverse-z transform of $X(z)= \log(1+az^{-1})$.	07
