

GUJARAT TECHNOLOGICAL UNIVERSITY**BE- SEMESTER-III (NEW) EXAMINATION – WINTER 2020****Subject Code:3131705****Date:10/03/2021****Subject Name:Dynamics of Linear Systems****Time:10:30 AM TO 12:30 PM****Total Marks:56****Instructions:**

1. Attempt any FOUR questions out of EIGHT questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

	MARKS
Q.1 (a) Explain the following signals.	03
i) Continuous time signal	
ii) Discrete time signal	
(b) Determine the linearity of the given discrete time sequences.	04
i) $y(n) = Ax(n) + B$	
ii) $y(n) = nx(n)$	
(c) Define ROC for z-transform? List the properties of the z-transform.	07
Q.2 (a) Calculate the z transform of finite duration sequence $x(n) = \{1, 2, 3, 4, 5\}$	03
(b) Explain Following Signals in brief.	04
i) Impulse Signal	
ii) Step Signal	
iii) Ramp Signal	
iv) Sinusoidal Signal	
(c) Define linear time invariant systems. Discuss properties of continuous and discrete LTI system.	07
Q.3 (a) Explain Fourier series representation of continuous time periodic signal.	03
(b) Determine Fourier series coefficient for	04
$x(t) = 1 + \sin \omega t + 2 \cos \omega t + \cos(2\omega t + \frac{\pi}{4})$.	
(c) Discuss properties of continuous time Fourier series in brief.	07
Q.4 (a) Explain Fourier series representation of discrete time periodic signal.	03
(b) Evaluate Fourier series coefficient for	04
$x(n) = 1 + \sin\left(\frac{2\pi}{N}n\right) + 3 \cos\left(\frac{2\pi}{N}n\right) + \cos\left(\frac{4\pi}{N}n + \frac{\pi}{2}\right)$.	
(c) Discuss properties of discrete time Fourier series in brief.	07
Q.5 (a) Find continuous time Fourier transform of (CTFT) $x(t) = e^{at}u(t)$,	03
$a > 0$	

- (b) Evaluate discrete time Fourier transform (DTFT) of LTI system with impulse response $h(n) = \alpha^n u(n)$ with $|\alpha| < 1$, and input of system $x(n) = \beta^n u(n)$ with $|\beta| < 1$. **04**
- (c) Explain properties of continuous time Fourier transform (CTFT) in brief. **07**
- Q.6** (a) Find discrete time Fourier transform (DTFT) of $x(n) = 3a^n u(n)$. **03**
- (b) Find continuous time Fourier transform (CTFT) of rectangular pulse signal $x(t) = \begin{cases} 1, & |t| < T_1 \\ 0, & |t| > T_1 \end{cases}$ and draw the result. **04**
- (c) Explain properties of discrete time Fourier transform (DTFT) in brief. **07**
- Q.7** (a) Compute Laplace transform of $x(t) = t$. **03**
- (b) Determine Laplace transform of $x(t) = 3e^{-2t} u(t) - 2e^{-t} u(t)$. **04**
- (c) Compute inverse z- transform of $x(z) = \frac{1 - \frac{1}{2} z^{-1}}{1 - \frac{1}{4} z^{-2}}$, $|Z| > \frac{1}{2}$. **07**
- Q.8** (a) Find Z- Transform of $x(n) = a^n u(n)$ **03**
- (b) Determine the Discrete time Fourier transform(DTFT) of $x(n) = \cos \omega_0 n$, take $\omega_0 = \frac{2\pi}{5}$, **04**
- (c) Determine Z- Transform of $x(n) = a^n (\cos \omega_0 n) u(n)$. **07**
