

GUJARAT TECHNOLOGICAL UNIVERSITY
BACHELOR OF ENGINEERING – SEMESTER 3 – EXAMINATION – SUMMER 2026

Subject Code: 3131705

Date: 17/06/2026

Subject Name: Dynamics of Linear 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.
4. Simple and non-programmable scientific calculators are allowed.

- Q.1** (a) Define continuous-time signal and discrete-time signal with suitable examples. 03
(b) Explain the significance of impulse response in LTI systems. 04
(c) Define impulse, unit step, ramp, and exponential signals. 07
- Q.2** (a) Explain causal and non-causal systems. 03
(b) Define periodic and aperiodic signals and state the mathematical condition for periodicity. 04
(c) Compute convolution of sequences $x(n)=[1,2,1]$ and $h(n)=[1,1,1]$. 07
- OR
- Q.2** (c) Verify commutative property of convolution using suitable sequences. 07
- Q.3** (a) Define impulse response and step response. 03
(b) Find the DTFT of $x(n) = [1, -2, 2, 3]$ 04
(c) Explain various classifications of signals such as continuous/discrete, periodic/aperiodic, and energy/power signals with examples. 07
- OR
- Q.3** (a) Explain the importance of LTI systems in signal analysis. 03
(b) Explain the significance of unit impulse and unit step signals in system analysis. 04
(c) Explain operations on signals such as amplitude scaling, time shifting, time reversal, and time scaling with examples. 07
- Q.4** (a) Define Discrete Time Fourier Transform. 03
(b) Explain frequency shifting property of DTFT. 04
(c) Obtain Fourier series representation of square wave signal. 07
- OR
- Q.4** (a) Find CTFT of unit impulse signal. 03
(b) Explain periodicity property of CTFT. 04
(c) Explain frequency domain representation of aperiodic signals using CTFT. 07
- Q.5** (a) Define inverse Z-transform. 03
(b) Explain significance of ROC in determining system stability. 04
(c) Explain inverse Laplace transform using partial fraction expansion. 07
- OR
- Q.5** (a) Define Laplace transform and write its mathematical expression. 03
(b) Explain time differentiation property of Laplace transform. 04

(c) Find Z-transform of $x(n)=a^n u(n)$.

07
