

GUJARAT TECHNOLOGICAL UNIVERSITY
BACHELOR OF ENGINEERING – SEMESTER 7 – EXAMINATION – SUMMER 2026

Subject Code: 3172007

Date: 29/05/2026

Subject Name: Modern Control 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) Compare Open Loop versus Closed Loop control systems. **03**
(b) Explain PID control using suitable block diagram. **04**
(c) Explain cascade PID compensation using frequency response technique. **07**
- Q.2** (a) State advantages of Bode plot. **03**
(b) Explain disturbance signals and their effects on control systems. **04**
(c) Derive computation of state transition matrix using Laplace transform method. **07**
- OR
- Q.2** (c) Explain solution of homogeneous and non-homogeneous state equations. **07**
- Q.3** (a) Define state, state variable and state space. **03**
(b) Explain derivation of transfer function from state model. **04**
(c) Obtain state space model for RLC series circuit. **07**
- OR
- Q.3** (a) Give properties of state transition matrix. **03**
(b) Explain observability of a system. **04**
(c) Explain conversion of state variable models to transfer function via direct, cascade and parallel decomposition. **07**
- Q.4** (a) Define nonlinear control systems and explain in brief. **03**
(b) Explain asymptotic and exponential stability. **04**
(c) Explain phase plane analysis of linear and nonlinear systems. **07**
- OR
- Q.4** (a) Explain application of Lyapunov stability theorem. **03**
(b) Explain standard nonlinearities in control systems. **04**
(c) Explain inverse z-transform using infinite series and partial fraction methods with example. **07**
- Q.5** (a) Compare analog and digital controllers. **03**
(b) State and explain Fuzzy logic control system. **04**
(c) What is reinforcement learning control? Explain it with suitable example. **07**

OR

- Q.5**
- | | |
|---|-----------|
| (a) Explain relationship between z-domain and s-domain. | 03 |
| (b) State and explain neural control system. | 04 |
| (c) With the help of suitable example explain embedded control system. | 07 |
