

GUJARAT TECHNOLOGICAL UNIVERSITY
MASTER OF ENGINEERING – SEMESTER 2 – EXAMINATION – SUMMER 2026

Subject Code: 3720728

Date: 11/06/2026

Subject Name: Digital Control & Its Applications

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.**

- Q.1** (a) Define Z transform of a function. Discuss briefly, various properties of Z transform. **07**
(b) What is quantization? Explain how an A/D converter converts an analog signal into bits **07**
- Q.2** (a) Draw a functional block diagram of “Digital Control System” showing signals in binary or graphic form and explain each its functional block. **07**
(b) Compare between “Digital Controllers and Analog Controllers” in detail. **07**
- OR
- Q.2** (b) Explain the correlation between s and z plane. **07**
- Q.3** (a) With the help of suitable example describe how stability of discrete time system can be assessed using Jury's test **07**
(b) Obtain controllable, Observable and Jordon's canonical form state variable model for a transfer function given as $G(z) = \frac{(15z^3 - 5z^2 + 15z - 10)}{(z - 1)(z - 2)}$ **07**
- OR
- Q.3** (a) Derive the discrete time transfer function from the discrete time state equations. **07**
(b) Obtain the discrete time state and output equations of the following (when the sampling period $T=1$) continuous time system: $1/s(s+1)$ **07**
- Q.4** (a) Explain Pole Placement using state feedback **07**
(b) Obtain the state feedback gain matrix K for a system such that the closed loop poles are located at 0.5, 0.6. System is given by **07**
- $$A = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix}$$
- $$B = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$$
- OR
- Q.4** (a) Write short note on: State Observer. **07**
(b) Enlist and explain the limitation(s) of state feedback control scheme. **07**
- Q.5** (a) Explain design of buck converter with digital control. **07**
(b) With the help of suitable example explain procedure to design a digital lead Compensator using frequency response plot **07**

OR

- Q.5** (a) Write short note on: Servo system. **07**
(b) Explain the design of a digital PD controller **07**
