

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE - SEMESTER-VIII EXAMINATION – SUMMER 2020****Subject Code: 2181705****Date: 27.10.2020****Subject Name:** Advanced Control Theory**Time: 02.30 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.

- Q.1** (a) Discuss the Concept of interaction and decoupling for Multi variable systems. **03**  
(b) Explain various applications of fuzzy logic control system. **04**  
(c) How the LTI discrete system can be represented in state space? Discuss on stability aspect in state space domain for the system. **07**

- Q.2** (a) List the methods of deriving Inverse Z-transform, explain it with suitable example. **03**  
(b) Explain Singular points in detail, with associated diagrams. **04**  
(c) How the PID controller can be implemented with a digital system? Explain with relevant equations. **07**

**OR**

- (c) Describe in Detail, on Relative Gain Array for Multi variable system Analysis with suitable Example. **07**

- Q.3** (a) Discuss on fuzzification process. **03**  
(b) What is two degree of freedom control? Explain in brief. **04**  
(c) Explain phase plane method. Show the procedure of construction of phase trajectories, for suitable example. **07**

**OR**

- Q.3** (a) Discuss the Effect of sample time on systems stability **03**  
(b) Define nonlinear system. Classify various types of nonlinearities. **04**  
(c) Describe the design of state feedback controller & state observer, with suitable example, in Discrete Domain. **07**

- Q.4** (a) What is the relationship between s and z domain? **03**  
(b) Discuss on De-fuzzification process. **04**  
(c) Obtain the describing function of relay with hysteresis type of nonlinearity. Comment on the memory type non-linearity and memory less non-linearity. **07**

**OR**

- Q.4** (a) What is zero order hold? Explain it brief. **03**  
(b) Make comparison between Describing Function Method and Phase plane method for Non-linear System, based on it's associated Features, Advantages & Limitations. **04**  
(c) State Lyapunov's theorem. Discuss the stability for Non linear system using it and explain it with suitable example. **07**

- Q.5** (a) Comments on stability of nonlinear system and concept of limit cycles, with diagrams. **03**

- (b) What is the Multivariable system? Draw and explain the block diagram of multivariable system with example. **04**
- (c) What is Describing Function Method? Explain DF Analysis method for Non-linear System, with suitable example. **07**

**OR**

- Q.5** (a) Describe the process of Discretization of continuous time system. **03**
- (b) Explain membership functions for fuzzy logic based systems. **04**
- (c) Discuss in Brief, about the stability in the z-domain. Explain the various methods to evaluate it, with suitable example. **07**

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