

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER-VIII (NEW) EXAMINATION – WINTER 2020

Subject Code:2181705
Date:28/01/2021
Subject Name:Advance Control Theory
Time:02:00 PM TO 04:00 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) Introduce terms positive definite, negative definite and indefinite function. | 03 |
| (b) Explain the Stability criterion by the Jury test. | 04 |
| (c) Explain Singular points in detail | 07 |
| Q.2 (a) Explain the block diagram of the digital control system. | 03 |
| (b) Write a note on Lyapunov's direct method | 04 |
| (c) How the PID controller can be implemented with a digital system? Explain with equations. | 07 |
| Q.3 (a) State sampling theorem. | 03 |
| (b) Write a note on state feedback design for discrete time system. | 04 |
| (c) Brief about stability in the z-domain. Explain with example | 07 |
| Q.4 (a) Comment on describing function analysis for nonlinear systems. | 03 |
| (b) Obtain the z-transform of Unit -Step function and unit ramp function | 04 |
| (c) Obtain discrete time state and output equations when the sampling period $T=1s$ of the following continuous time system | 07 |
| $G(s) = \frac{1}{s(s+2)}$ | |
| Q.5 (a) Derive the relationship between z and s-domain. Also explain the mapping of s-domain in to z-domain. | 03 |
| (b) List out the properties of z-transform and explain any two. | 04 |
| (c) Obtain the describing function of relay with dead zone type of non-linearity. | 07 |
| Q.6 (a) Give the application of fuzzy logic in control system. | 03 |
| (b) Explain phase plane method & construction of phase trajectories. | 04 |
| (c) Find the z-transform of (1) k^2 (2) ka^{k-1} ; $k \geq 1$ (3) k^2a^{k-1} ; $k \geq 1$ | 07 |
| Q.7 (a) What is two degrees of freedom control? | 03 |
| (b) What are fuzzy membership function and its types | 04 |
| (c) Explain Relative Gain Array | 07 |
| Q.8 (a) Describe Discretization of continuous time system. | 03 |
| (b) What are fuzzy membership function and its types | 04 |
| (c) Explain multivariable systems with example. What is interacting and non-interacting systems? | 07 |
