Seat No.: _____ Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject Code:2172412 **Date:21/01/2021**

Subject Name:Advanced Control Systems

Time:10:30 AM TO 12:30 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)**	Define z- transformation.	**03**
	(b)	State any four properties of z transformation.	**04**
	(c)	Convert standard test signals unit step and unit ramp into z domain.	**07**
Q.2	**(a)**	What is data hold?	**03**
	(b)	State relation between s plane function and Z plane function.	**04**
	(c)	Explain digital filters in brief with example.	**07**
Q.3	**(a)**	What is state?	**03**
	(b)	Define state variable and state model.	**04**
	(c)	Represent system having integro-differential equation $m\ddot{y} + b\dot{y} + ky = u$ into state space model. Assume u is input and y is output.	**07**
Q.4	**(a)**	What is eigen values?	**03**
	(b)	How eigen values of a system are related to system poles?	**04**
	(c)	Explain controllability and observability.	**07**
Q.5	**(a)**	State common physical non linearities.	**03**
	(b)	What is effect of addition of observer on a closed loop system?	**04**
	(c)	Explain pole placement design.	**07**
Q.6	**(a)**	What is a phase plane?	**03**
	(b)	Explain describing function method.	**04**
	(c)	Design a type 1 servo system when the plant TF has an integrator for the plant TF given by $\frac{Y(S)}{U(S)} = \frac{1}{S(S+1)(S+2)}$. The desired closed loop poles are at $S = -2 \pm j2\sqrt{3}$ and $S = -10$. Input r is a step function.	**07**
Q.7	**(a)**	What is Lyapunov direct method?	**03**
	(b)	What are the methods of constructing Lyapunov function for Nonlinear systems?	**04**
	(c)	Explain Lyapunov stability criteria.	**07**
Q.8	**(a)**	What are the differences between optimal control and conventional control?	**03**
	(b)	Explain calculus of variations.	**04**
	(c)	Explain LQR problem.	**07**

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