Seat No.: _____ Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VIII(NEW) EXAMINATION – SUMMER 2019

Subject Code:2180913 **Date:09/05/2019**

Subject Name:Advanced Control Systems

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.**

			MARKS
Q.1	**(a)**	Write and prove the properties of State Transition Matrix (STM).	**03**
	(b)	Explain State Space Representation of Nth Order Linear Differential Equation.	**04**
	(c)	Determine the necessary and sufficient condition for a system to be completely state controllable using Kalman's Controllability test.	**07**
Q.2	**(a)**	What is disturbance signal in control system? Explain how disturbance can be reduced using feedback control system.	**03**
	(b)	Discuss necessary and sufficient condition for state observation.	**04**
	(c)	Write a short note on advantages and limitations of state variable approach.	**07**
		OR	
	(c)	Explain why do we need state variable approach to control system analysis? How it is superior to classical approach?	**07**
Q.3	**(a)**	Draw and explain generalized block diagram of state space equations.	**03**
	(b)	Discuss basic feature of following non linearities: 1) Non linear friction 2) On off controller	**04**
	(c)	Explain sampled data control system using suitable block diagram.	**07**
		OR	
Q.3	**(a)**	Explain the construction of a phase trajectories by delta method.	**03**
	(b)	Explain observability for a state space system using suitable block diagram.	**04**
	(c)	Explain Cayley Hamilton Theorem and discuss how it can be used to find the state transition matrix.	**07**
Q.4	**(a)**	Explain the design procedure of a full state observer.	**03**
	(b)	Explain Lyapunov's second method and his stability theorem.	**04**
	(c)	Discuss the concept of Kalman's controllability and observability test in detail.	**07**
		OR	
Q.4	**(a)**	Explain positive definite, positive semi definite and indefinite function.	**03**
	(b)	Define the terms State Variable and State Transition Matrix.	**04**
	(c)	Explain need for reshaping of root locus plot.	**07**
Q.5	**(a)**	Explain Cascade decomposition method.	**03**
	(b)	Explain Pell's Method in Phase Plane Analysis.	**04**
	(c)	What are the singular points? Explain different singular points adopted in non linear control system.	**07**
		OR	
Q.5	**(a)**	Give comparison between transfer function based control design and state variable based control design.	**03**
	(b)	Explain Lienard's Method in Phase Plane Analysis.	**04**
	(c)	Prove that the necessary and sufficient condition for arbitrary pole placement is that the system is completely state controllable.	**07**

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