Seat No.: _____ Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– VIII (New) EXAMINATION – WINTER 2019

Subject Code: 2180913 **Date: 21/11/2019**

Subject Name: Advanced Control Systems

Time: 02:30 PM 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)**	What are the advantages of state space modeling technique over the transfer function modeling technique in control system analysis?	**03**
	(b)	With neat block diagram representations discuss cascade decomposition	**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)**	Define the terms State Variable and State Transition Matrix.	**03**
	(b)	Explain State Space Representation of Nth Order Linear Differential Equation	**04**
	(c)	Explain why do we need state variable approach to control system analysis?	**07**
		OR	
	(c)	Explain Cayley Hamilton Theorem and discuss how it can be used to find the state transition matrix.	**07**
Q.3	**(a)**	Write and prove the properties of State Transition Matrix (STM).	**03**
	(b)	Explain Pell's Method in Phase Plane Analysis	**04**
	(c)	Discuss the concept of Kalman's controllability and observability test in detail.	**07**
		OR	
Q.3	**(a)**	When is a system said to be completely controllable?	**03**
	(b)	Explain Lienard's Method in Phase Plane Analysis	**04**
	(c)	Write a short note on advantages and limitations of state variable approach.	**07**
Q.4	**(a)**	Explain Pell's Method in Phase Plane Analysis	**03**
	(b)	Explain Cayley Hamilton Theorem and discuss how it can be used to find the state transition matrix.	**04**
	(c)	Explain state variable approach to control system analysis is superior to classical approach?	**07**
		OR	
Q.4	**(a)**	Explain the design procedure of a full state observer.	**03**
	(b)	Discuss basic feature of following non linearities 1).non linear friction 2).on off controller	**04**
	(c)	Prove that the necessary and sufficient condition for arbitrary pole placement is that the system is completely state controllable.	**07**
Q.5	**(a)**	Explain the construction of a phase trajectories by delta method	**03**
	(b)	Explain Liapunov's second method and his stability theorem.	**04**
	(c)	Explain sampled data control system using suitable block diagram	**07**
		OR	
Q.5	**(a)**	Explain positive definite, positive semi definite and indefinite function	**03**
	(b)	Discuss necessary and sufficient condition for state observation	**04**
	(c)	What are the singular points? Explain different singular points adopted in non linear control system?	**07**

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