

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
