Seat No.: _____ Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject Code: 2161707 **Date: 04/12/2019**

Subject Name: Control System Design

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.**

			MARKS
Q.1	**(a)**	State the Properties of the State Transition matrix.	**03**
	(b)	Explain a Dead beat response with necessary sketch.	**04**
	(c)	Define Compensator. Explain the various types of Compensation with necessary diagram.	**07**
Q.2	**(a)**	Explain a Phase Lead compensator using RC Network.	**03**
	(b)	Give the Procedure for Designing a Phase Lag Compensator in Time Domain.	**04**
	(c)	Design a suitable compensator for the system having the open loop transfer function G(S) = K / S(S+2) to meet the following specifications: (i) Damping ratio ζ=0.707 (ii) Settling Time $t_s \leq 5$ Sec (iii) $K_{v \geq 4}$	**07**
		OR	
	(c)	Explain the System with a Prefilter with example.	**07**
Q.3	**(a)**	Explain a Phase Lag compensator using RC Network.	**03**
	(b)	Design a State space model of the RLC Network.	**04**
	(c)	Explain the Controllability and Observability with suitable example.	**07**
		OR	
Q.3	**(a)**	Give the importance of Internal model Design.	**03**
	(b)	Give the Procedure for designing a Phase Lead Compensator in Frequency Domain.	**04**
	(c)	Explain Lyapunov stability for linear system.	**07**
Q.4	**(a)**	Give the S – Plane Representation of Lag, Lead and Lead-Lag Compensator.	**03**
	(b)	State and explain Observable Canonical form.	**04**
	(c)	A Unity feedback system has OLTS G(S) = K/ S(1+2S). Design a suitable compensator so that the Phase margin is ≥ 40. and steady state error for the ramp input is ess ≤ 0.2. Also to comment on stability.	**07**
		OR	
Q.4	**(a)**	Define System Sensitivity.	**03**
	(b)	Explain the optimal control system with an example.	**04**
	(c)	Explain the Full state feedback control with observer design.	**07**
Q.5	**(a)**	How to analyze the Robustness of any System?	**03**
	(b)	Define the Following: (1)Canonical variable and Digonalization (2) Eigen value (3)Caylay Hamilton theorem (4) Ackerman's formula	**04**
	(c)	State algebraic Riccatti equation and write short note on LQR design.	**07**
		OR	
Q.5	**(a)**	Discuss the bode diagram with Analytical method.	**03**
	(b)	Explain the System with uncertain parameter.	**04**
	(c)	Explain robust PID Controller.	**07**

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