Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII (OLD) - EXAMINATION – SUMMER 2017

Subject Code: 171701 **Date: 09/05/2017**

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.**

Q.1	**(a)**	Define state variable and state model. If a system has two inputs, one output and three states, find out the dimensions of the various matrices of the state model. Explain the need of diagonalisation technique.	**07**
	(b)	State the Computer (MatLab) commands used for State variable analysis with Syntax/code and its related outputs. Mention appropriate comments also.	**07**
Q.2	**(a)**	Explain the implementation of digital (PID, PD and PI) controllers with Necessary steps.	**07**
	(b)	State an Ackermann's formula. Show the Computation of State Controllability and Observability using it. What is its limitation?	**07**
		OR	
	(b)	Explain the compensator design with integrated full-state feedback and observer.	**07**
Q.3	**(a)**	Explain Pseudo Quantative Feedback theory with suitable Example.	**07**
	(b)	Give the design of Robust PID control system.	**07**
		OR	
Q.3	**(a)**	Explain ZOH and compensate closed loop control system with digital computer realization.	**07**
	(b)	Explain the systems with pre-filter.	**07**
Q.4	**(a)**	Discuss about internal model design for step input tracking with mathematical arguments for optimal control system.	**07**
	(b)	Determine the Z transform for $f(t) = \sin(wt)$ and $f(t) = e^{-at}$.	**07**
		OR	
Q.4	**(a)**	Explain the control of uncertain parameter in Robust control system & stability	**07**
	(b)	Explain design of a dead beat response of a system.	**07**
Q.5		Design a suitable compensator in time domain for unity feedback system to meet following performance specifications. Natural frequency t_s=10 sec, Damping factor ζ=0.4 and $K_v \geq 5$ sec $^{-1}$. $G(s) = K / s^2 (s + 1.5)$.	**14**
		OR	
Q.5		Design a suitable compensator in frequency domain for unity feedback system to meet following performance specifications. Settling time Kv _5 Sec^{-1} , phase margin _ 42°, Wb = 1.02 rad/sec. $G(s) = 0.25 K / s (s + 1)(0.25 s +1)$.	**14**

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