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

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject Code: 2172007 **Date: 09/05/2017**

Subject Name: Modern Control Systems(Departmental Elective - II)

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 is steady state accuracy for a control system? Explain how steady state accuracy can be increased using feedback control system.	**07**
	(b)	Explain integral mode of feedback control system using suitable block diagram.	**07**
Q.2	**(a)**	Explain various rules for construction of root-locus.	**07**
	(b)	Discuss compensations characteristics for cascade lead compensator.	**07**
		OR	
	(b)	Design a lag compensator using root-locus technique for a system with open loop transfer function $$G(s) = \frac{k}{s(s+2)(s+8)}$$ To meet following specifications: (i) Damping ratio=0.5 (ii) Settling time =5 (iii) Velocity error >5	**07**
Q.3	**(a)**	Explain design procedure for cascade lag compensator using bode-plot.	**07**
	(b)	An open loop transfer function is given as: $$G(s) = \frac{k}{s(1+s)}$$ It is desired to have velocity error constant Kv= $12\ sec^{-1}$ and phase margin as 40°. Design a lead compensator using bode-plot technique.	**07**
		OR	
Q.3	**(a)**	Explain design procedure for cascade PID compensator using bode-plot.	**07**
	(b)	Design a phase lag compensator for $$G(s) = \frac{k}{s(1+0.2s)(1+0.2s)}$$ to have phase margin 45°	**07**
Q.4	**(a)**	Discuss limitations of transfer functions and advantages of analysis of control system using state space.	**07**
	(b)	Explain Eigen value and Eigen vector. Also explain model matrix.	**07**
		OR	
Q.4	**(a)**	Explain Taylor series expansion for computing the state transition matrix.	**07**
	(b)	Determine the transfer matrix for the data $A=\begin{bmatrix}-3 & 1\\ 0 & -1\end{bmatrix}$; $B=\begin{bmatrix}1\\1\end{bmatrix}$; $C=\begin{bmatrix}1 & 1\end{bmatrix}$;D=0	**07**
Q.5	**(a)**	Explain the term controllability. Derive the controllability of a system with the help of controllability test matrix.	**07**
	(b)	Explain various properties of z-transform.	**07**
		OR	
Q.5	**(a)**	Briefly describe the configuration of a state feedback control design using pole placement technique	**07**

(b) Discuss the stability analysis of sampled-data control systems. **07**

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