Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII(OLD) • EXAMINATION – WINTER 2016

Subject Code: 172007 Date: 18/11/2016

Subject Name: Modern Control Systems (Department Elective - I)

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.**

Q.1	**(a)**	List various aspects of designing a control system. Explain all of them in details.	**07**
	(b)	Explain derivative mode of feedback control.	**07**
Q.2	**(a)**	Explain cascade lead compensation.	**07**
	(b)	Explain purpose of reshaping the root locus.	**07**
		OR	
	(b)	The open loop transfer function of the uncompensated system is $$G(s) = \frac{K}{s(s+2)}$$ It desired to compensate the system so as to meet the following transient response specifications Damping ratio=0.707 Settling time, ts < 5 sec Velocity error kv>=4. Design a cascade lag compensator.	**07**
Q.3	**(a)**	Give difference between phase lead, phase lag and phase lag-lead Compensation.	**07**
	(b)	Discuss cascade PID compensation using Bode-plots.	**07**
		OR	
Q.3	**(a)**	Derive the solution of state equation using infinite series method.	**07**
	(b)	Discuss conversion of state variable models to transfer functions.	**07**
Q.4	**(a)**	Explain the generalized block diagram of sampled data control system and mention the function of each block.	**07**
	(b)	Determine the z-transform of the function $$F(s) = \frac{1}{s2+2s+2}$$ Assume sampling time=1 sec.	**07**
		OR	
Q.4	**(a)**	Explain the jury's stability criterion with suitable example.	**07**
	(b)	Define and explain properties of z-transform.	**07**
Q.5	**(a)**	Derive the condition for controllability and Observability.	**07**
	(b)	Discuss the pole placement technique using the state feedback controller.	**07**
		OR	
Q.5	**(a)**	Explain the methods used for solution of state equation.	**07**
	(b)	Discuss state feedback with integral control.	**07**

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