Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI (NEW) EXAMINATION – WINTER 2023

Subject Code:3160104 Date:05-12-2023

Subject Name: Basic control theory

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.**
4. **Simple and non-programmable scientific calculators are allowed.**

			MARKS
Q.1	**(a)**	Define control system. Classify control system on different basis.	**03**
	(b)	Compare block-diagram and signal flow graph method.	**04**
	(c)	Explain Open loop and Closed loop control system with examples.	**07**
Q.2	**(a)**	Explain Mason's gain formula.	**03**
	(b)	What is transfer function? Discuss properties, advantages, and disadvantages of it.	**04**
	(c)	Discuss characteristics of an ideal control system.	**07**
		OR	
	(c)	Explain rules for block-diagram reduction technique.	**07**
Q.3	**(a)**	Explain the conditions for Stable, marginally stable and Unstable systems.	**03**
	(b)	Discuss Hurwitz's stability criteria.	**04**
	(c)	Explain Routh's criterion to check the stability of a system.	**07**
		OR	
Q.3	**(a)**	Define following terms. 1) Rise time 2) Settling time 3) Peak time	**03**
	(b)	Discuss standard Test signals used in control system.	**04**
	(c)	Explain steady state error in detail.	**07**
Q.4	**(a)**	Explain concept of Relative stability.	**03**
	(b)	Write a short note on PID controller.	**04**
	(c)	Explain rules for construction of root locus.	**07**
		OR	
Q.4	**(a)**	Discuss Nyquist criteria for stability.	**03**
	(b)	Write a short note on state space representation of a control system.	**04**
	(c)	Describe Correlation between transfer function and state space equations with suitable examples.	**07**
Q.5	**(a)**	Explain ON-OFF controller.	**03**
	(b)	Define the following terms. 1) Gain cross over frequency 2) Phase cross over frequency 3) Gain Margin 4) Phase Margin	**04**
	(c)	Explain steps to plot Bode plot.	**07**
		OR	
Q.5	**(a)**	Define: (i) State (ii) State Variable (iii) State Vector	**03**
	(b)	List Advantages of State variable analysis	**04**
	(c)	Explain phase lag compensator in detail	**07**

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