Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–III (NEW) EXAMINATION – WINTER 2020

Subject Code:3130905 Date:05/03/2021

Subject Name:Control System Theory

Time:10:30 AM TO 12:30 PM Total Marks:56

Instructions:

1. **Attempt any FOUR questions out of EIGHT questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

			MARKS
Q.1	**(a)**	Explain transfer function and write its advantages and dis advantages.	**03**
	(b)	Derive steady state error constants of the Type-1 system for a Step input.	**04**
	(c)	Describe the step by step procedure for reduction of Block diagram.	**07**
Q.2	**(a)**	Define: rise time, peak over shoot and settling time.	**03**
	(b)	Draw the step response of values of damping ration (i) $\zeta > 1$ (ii) $\zeta = 1$ (iii) $\zeta < 1$ (iv) $0 < \zeta < 1$	**04**
	(c)	Explain the requirements of an ideal control system.	**07**
Q.3	**(a)**	Write short note on marginally stable system	**03**
	(b)	How stability can be ensured from Routh Table?	**04**
	(c)	Explain Type 0, Type 1 and Type 2 control system. Derive equation for the steady state error of the Type 2 control system for step, ramp and parabolic input.	**07**
Q.4	**(a)**	Explain correlation between time domain and frequency domain	**03**
	(b)	State the advantages of bode plot	**04**
	(c)	Define the following terms: Gain margin, phase margin, bandwidth, resonant peak, resonant frequency and gain cross over frequency.	**07**
Q.5	**(a)**	Write the application of frequency response methods.	**03**
	(b)	Define Magnitude and angle criteria for the Root Locus analysis.	**04**
	(c)	State and explain nyquist stability criteria.	**07**
Q.6	**(a)**	Explain feedback control system	**03**
	(b)	Explain the effect of derivative control action on system performance.	**04**
	(c)	Write short note on PID controller.	**07**

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Q.7	**(a)**	List out types of compensation and explain any one	**03**
	(b)	How will you define controllability and observability of the system?	**04**
	(c)	Write steps to design Lag Compensator using Root Locus.	**07**
Q.8	**(a)**	Define following terms. 1) State variable 2) State trajectory 3) State vector.	**03**
	(b)	Write difference between state space analysis and transfer function.	**04**
	(c)	How state space analysis method is different than classical methods. Explain in detail.	**07**

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