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

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   **07**
in detail.

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