Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–III (NEW) EXAMINATION – WINTER 2024

Subject Code: 3131101 **Date: 26-11-2024**

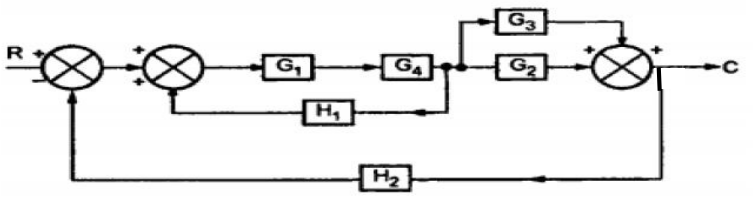
Subject Name: Control Systems

Time: 10:30 AM TO 01:00 PM **Total Marks: 70**

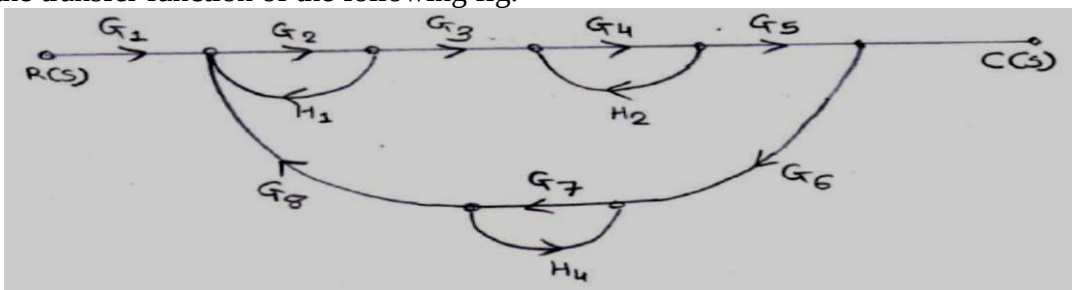
Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			Marks
Q.1	**(a)**	Define standard test signals.	**03**
	(b)	Determine the transfer function for the following system.	**04**



	(c)	Compare open loop control system and closed loop control system with suitable examples.	**07**
Q.2	**(a)**	State advantages and limitations of Routh stability criterion.	**03**
	(b)	Discuss Nyquist criteria for stability.	**04**
	(c)	Derive the expression of a second order control system subjected to unit step signal.	**07**
		OR	
	(c)	Derive the expression of a first order control system subjected to unit step signal.	**07**
Q.3	**(a)**	Discuss the effect of feedback on stability.	**03**
	(b)	Compare time response and phase response of the system.	**04**
	(c)	Derive the expressions for the error coefficients k_p , k_v and k_a corresponding to step, ramp and parabolic input respectively.	**07**
		OR	
Q.3	**(a)**	Discuss the effect of feedback on time constant.	**03**
	(b)	Obtain the expression of steady state error.	**04**
	(c)	Find the transfer function of the following fig.	**07**



Q.4	**(a)**	Define i) Rise time ii) Peak time iii) Settling time	**03**
	(b)	Explain Force Voltage analogy.	**04**
	(c)	Sketch the complete root locus of system having $G(s)\,H(s) = \frac{K}{S(S+1)(S+3)}$	**07**

OR

Q.4	**(a)**	Define i) Gain Margin ii) Frequency response iii) Phase Margin	**03**
	(b)	Explain Force Current analogy.	**04**
	(c)	State root locus techniques rules.	**07**
Q.5	**(a)**	What is transfer function? Discuss its properties.	**03**
	(b)	Explain polar plot with example	**04**
	(c)	State and explain compensator. Explain Phase-Lead compensator in detail.	**07**

OR

Q.5	**(a)**	Discuss briefly PID controller.	**03**
	(b)	Explain steps of bode plot.	**04**
	(c)	Write a short note on state space representation of a control system.	**07**

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