Enrollment No./Seat No.:

GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering - SEMESTER - III EXAMINATION - SUMMER 2025

Subject Code: 3131101 **Date: 29-05-2025**

Subject Name: Control Systems

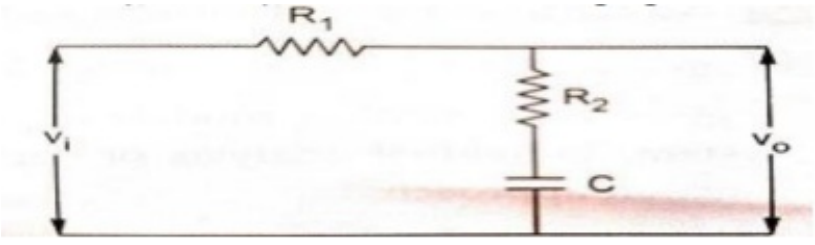
Time: 02:30 PM TO 05:00 PM **Total Marks: 70**

Instructions

1. Attempt all questions.

2. Make suitable assumptions wherever necessary.

3. Figures to the right indicate full marks.

			Marks
Q.1	**(a)**	Define i) Settling time ii) Peak time iii) Peak Overshoot	**03**
	(b)	Explain Force Voltage analogy.	**04**
	(c)	Derive the expression of a second order control system subjected to unit step signal.	**07**
Q.2	**(a)**	State advantages and limitations of Routh stability criterion.	**03**
	(b)	Explain the steps of Bode plot.	**04**
	(c)	State root locus technique rules.	**07**
		OR	
	(c)	Sketch the complete root locus of system having unity feedback and $G(S) = \frac{K}{S(S+2)(S+4)}$	**07**
Q.3	**(a)**	Explain standard test signals.	**03**
	(b)	Find laplace transform of x(t) = cosh (4t)	**04**
	(c)	Explain the following controllers (!) PID controller (2) P controller (3) PI controller	**07**
		OR	
	(a)	Define i) State vector ii) Delay time iii) Rise time	**03**
	(b)	Write properties of transfer function.	**04**
	(c)	Find the transfer function of the following fig. 	**07**
Q.4	**(a)**	Define i) Marginally stable state ii) Conditional stable state iii) Unstable state.	**03**
	(b)	Explain Nyquist Stability Criteria.	**04**

	(c)	Obtain the expression of steady state error. Also, find the equations for static error coefficients.	**07**

OR

	(a)	Write advantages of state space approach over classical methods.	**03**
	(b)	Explain polar plot with suitable example.	**04**
	(c)	Write all the rules of Block Diagram Reduction technique.	**07**
Q.5	**(a)**	Define i) Gain Margin ii) Frequency response iii) Phase Margin	**03**
	(b)	Explain Mason's Gain Formula.	**04**
	(c)	State and explain compensator. Explain Phase-Lag compensator in detail.	**07**

OR

	(a)	Compare open loop and closed loop control systems.	**03**
	(b)	Explain gain crossover frequency and phase crossover frequency.	**04**
	(c)	Explain Phase-Lead compensator in detail.	**07**

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