Seat No.: _____ Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– IV (New) EXAMINATION – WINTER 2019

Subject Code: 2141708 **Date: 10/12/2019**

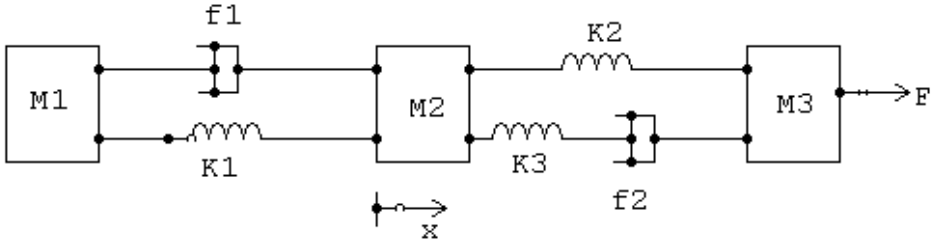
Subject Name: Control System

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.**

Q.1	**(a)**	Introduce stability of the systems.	**03**
	(b)	Give details about type and order of the system.	**04**
	(c)	Explain mathematical modeling of armature controlled DC servomotors.	**07**
Q.2	**(a)**	Explain importance of Eigen values.	**03**
	(b)	Write benefits of closed loop system over open loop system.	**04**
	(c)	Mention difference between transfer function approach and state space approach.	**07**
		OR	
	(c)	With suitable example explain modeling in state space.	**07**
Q.3	**(a)**	Discuss about frequency response analysis using polar plot.	**03**
	(b)	Determine the stability using Routh Criterion. $s^4 + 5s^3 + 20s^2 + 50s + 40 = 0$	**04**
	(c)	Draw second order unit step response and explain associated specification terms.	**07**
		OR	
Q.3	**(a)**	Give difference between transient and steady state response with suitable example.	**03**
	(b)	Define following terms: i. Rise time ii. Settling time iii. Distributed parameter system iv. Time variant control system	**04**
	(c)	Find the transfer function and develop F → V analogy for system shown in figure. Write necessary equations.	**07**



Q.4	**(a)**	Discuss application of Nichol chart.	**03**
	(b)	Sketch root locus for following open loop transfer function $G(s) = \frac{k}{s(s+4)}$	**04**

(c) Draw Bode plot for following transfer function **07**

$$G(s)H(s) = \frac{10(s+10)}{s(s+2)(s+30)}$$

OR

Q.4 **(a)** Briefly write about constant M, N circles. **03**

(b) Apply Nyquist stability criterion for the stability analysis of the following unity feedback system. **04**

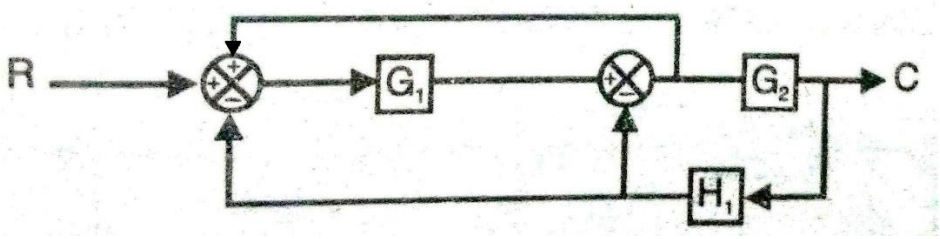
$$G(s)H(s) = \frac{s+3}{(s+1)(s-1)}$$

(c) Draw root locus for following transfer function **07**

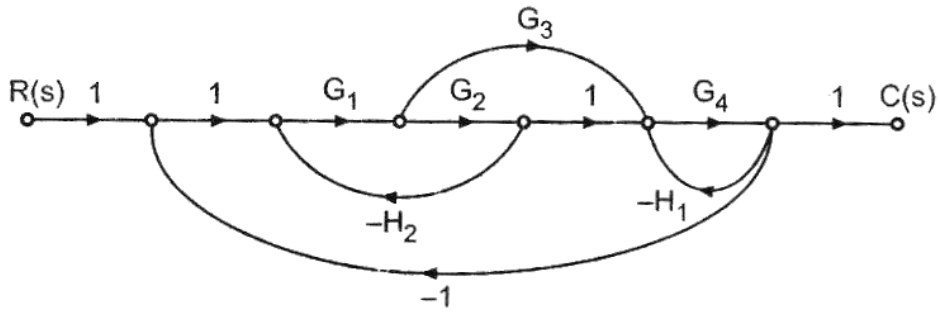
$$G(s)H(s) = \frac{k}{s^2(s+1)}$$

Q.5 **(a)** Give importance of gain margin and phase margin in frequency response analysis. **03**

(b) Find transfer function of following system using block diagram reduction method. **04**



(c) Using mason gain formula find transfer function for system shown in figure **07**



OR

Q.5 **(a)** Define and introduce state transition matrix. **03**

(b) Write about linear versus nonlinear systems. **04**

(c) What is steady state error? Derive value of steady state error for type 2 system with ramp input. **07**

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