Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV (NEW) - EXAMINATION – SUMMER 2017

Subject Code: 2141708 **Date: 01/06/2017**

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.**

			MARKS
Q.1		**Short Questions**	**14**
	1	Define relative stability.	
	2	What is the damping factor of undamped system?	
	3	Define linear time invariant system.	
	4	Can we assign initial conditions in state space analysis?	
	5	Give the name of any one method to find absolute stability.	
	6	What is the starting point of root locus?	
	7	What should be the damping factor of a Lift?	
	8	What is the effect of a non-minimum phase system?	
	9	How to find mathematical model?	
	10	Define non-linear system.	
	11	What is the Laplace transform of dx/dt?	
	12	What is the use of signal flow graph?	
	13	On imaginary axis in root locus, what is the value of ξ?	
	14	Define resonance peak in the bode plot.	
Q.2	**(a)**	Compare open loop versus close loop system in terms of speed of response with examples.	**03**
	(b)	Explain relationship between impulse response and transfer function of any system.	**04**
	(c)	Write short note on systems with delay.	**07**
		OR	
	(c)	Obtain a state space model of an RC network having Capacitor voltage as an output.	**07**
Q.3	**(a)**	How to linearise the non-linear system?	**03**
	(b)	Explain Liquid level systems in brief.	**04**
	(c)	Obtain the model of gear system.	**07**
		OR	
Q.3	**(a)**	Explain different steady state errors.	**03**
	(b)	Explain thermal system in brief.	**04**
	(c)	Using signal flow graph, obtain the closed loop transfer function of the whose block diagram is shown in figure 1 below.	**07**

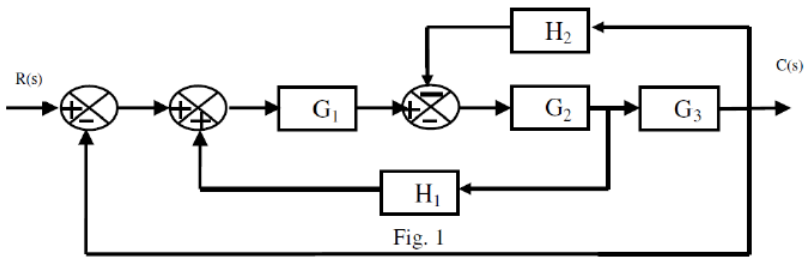

Fig. 1

Q.4	**(a)**	Check the stability of a system whose characteristic equation is given by $s^4 + 10\,s^3 + 16\,s^2 + 18\,s + 7 = 0$.	**03**
	(b)	Discuss the limitations of transfer functions and advantages of analysis of control systems using state space.	**04**
	(c)	Sketch the root locus for an open loop transfer function, $$G(s) = k/s(s+2)(s+6)$$	**07**

OR

Q.4	**(a)**	Obtain the step response of a system given by $$G(s) = 5/s(s+7)$$	**03**
	(b)	Discuss the step response of a second order system.	**04**
	(c)	Sketch the root locus for an open loop transfer function, $$G(s) = k(s+2)/s(s+1)$$	**07**
Q.5	**(a)**	How to find stability of a system using gain and phase margin.	**03**
	(b)	Explain constant M and N circles in the Nichols chart	**04**
	(c)	Draw the nyquist plot for the following loop transfer function $$G(s)H(s) = \frac{(s+2)}{(s+1)(s-1)}.$$	**07**

OR

Q.5	**(a)**	Determine the transfer function of the system given below by state space model, A=[-2 1; 0 -1], B=[1 1]′, C=[1 1], D=0.	**03**
	(b)	Draw the polar plot of $G(s) = 9/s(s+3)$	**04**
	(c)	Draw the bode plot for an open loop transfer function given by $$G(s)H(s) = \frac{64(s+2)}{s(s+0.5)(s^2+3.2s+64)}.$$	**07**

****