Seat No.: _____ Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VIII(NEW) EXAMINATION – SUMMER 2019

Subject Code:2181705 **Date:17/05/2019**

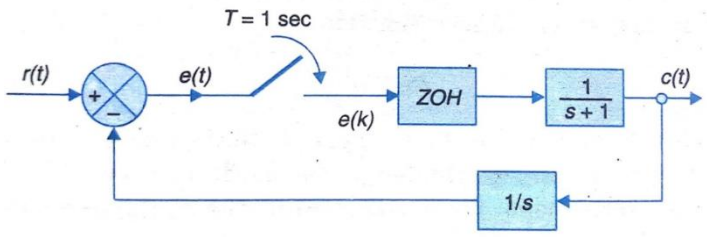
Subject Name:Advance Control Theory

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	**(a)**	State effect of sample time on stability of LTI system.	**03**
	(b)	Comment on stability of nonlinear system and limit cycles.	**04**
	(c)	Derive the transfer function of Zero order hold.	**07**
Q.2	**(a)**	Explain the block diagram of the digital control system.	**03**
	(b)	Explain phase plane, phase trajectory, phase portrait.	**04**
	(c)	Explain Singular points in detail	**07**
		OR	
	(c)	Describe the digital implementation of PID controller.	**07**
Q.3	**(a)**	State sampling theorem.	**03**
	(b)	Obtain the z-transform of Unit -Step function	**04**
	(c)	Consider the system described by y(k)-0.6y(k-1)-0.81y(k-2)+0.67y(k-3)-0.12y(k-4)=x(k) Where x(k) is the input and y(k) is the output of the system. Determine the stability of the system.	**07**
		OR	
Q.3	**(a)**	List the methods of inverse Z-transform.	**03**
	(b)	Find the z-domain transfer function of the following *s* domain transfer functions i.) $\frac{a}{(s+b)^2+a^2}$ ii.) $\frac{s}{(s+a)^2}$	**04**
	(c)	For the sampled-data control system shown in figure. Find the output c(k) for r(t)=unit step.	**07**



Q.4	**(a)**	Derive the relationship between z and s-domain. Also explain the mapping of s-domain in to z-domain.	**03**
	(b)	Explain the describing function analysis?	**04**
	(c)	Obtain the describing function of relay with hysteresis type of non-linearity. Comment on the memory type non-linearity and memory less non-linearity.	**07**
		OR	
Q.4	**(a)**	Give the application of fuzzy logic in control system.	**03**
	(b)	What is RGA analysis?	**04**
	(c)	Design the state feedback controller for the system	**07**

$$x(k+1)=\begin{bmatrix}0 & 1\\ -0.16 & -1\end{bmatrix}x(k)+\begin{bmatrix}0\\ 1\end{bmatrix}u(k)$$

Such that the systems will have closed loop poles are z=0.5±j0.5

Q.5 **(a)** Examine the stability of the following characteristic equation: **03**

$$P(z)=z^3-1.1z^2+0.1z-0.2=0$$

b) What are fuzzy membership function and its types **04**

(c) Explain fuzzification and defuzzification briefly. Also write the features of membership function **07**

OR

Q.5 **(a)** What is two degrees of freedom control? **03**

(b) Explain the graphical method of drawing the phase plane with suitable example. **04**

(c) Explain multivariable systems with example. What is interacting and non-interacting systems? **07**

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