GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–V (NEW) EXAMINATION – SUMMER 2019

Subject Code: 2151705   **Date: 31/05/2019**
Subject Name: Process 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 dead time in process control. Explain its effect on system stability.	**03**
	(b)	What causes inverse response? Explain with mathematical arguments.	**04**
	(c)	Derive the transfer function of non interacting two tank system with linear resistance element.	**07**
Q.2	**(a)**	With the help of suitable example, explain servo and regulatory control system.	**03**
	(b)	Explain any one method for obtaining First Order Plus Time Delay (FOPTD) approximate model for processes.	**04**
	(c)	Derive the mathematical model of continuous stirred tank heater with its process loop.	**07**
		OR	
	(c)	Discuss two position control with and without neutral zone. What is the effect of neutral zone on controller output?	**07**
Q.3	**(a)**	Explain direct and reverse mode of control action with the help of example.	**03**
	(b)	Explain multi position control in brief.	**04**
	(c)	Analyze the closed loop response of first order system with proportional control to unit step change in set point and unit step change in process load.	**07**
		OR	
Q.3	**(a)**	An integral controller is used for speed control with a set point of 12 rpm within a range of 10-15 rpm. Initially, at zero error the controller output is 22%. The constant $K_I = -0.15\%$ controller output per second per percentage error. If the speed jumps to 13.5 rpm, calculate the controller output after 2 seconds for a constant e_p.	**03**
	(b)	What is offset in case of proportional control action? How offset can be eliminated? Explain.	**04**
	(c)	Explain the composite PI controller with equation, transfer function and draw the response of PI controller to step input of error.	**07**
Q.4	**(a)**	What is self regulation? Give an example of self regulating process.	**03**
	(b)	Briefly discuss velocity form of discrete PID controller. Also state its advantages over position form of the algorithm.	**04**
	(c)	Explain Integral wind up and anti-wind up scheme to prevent it.	**07**

Q.4	**(a)**	Draw and explain unit step response of an integrating process.	**03**
	(b)	Briefly discuss position form of discrete PID controller. Also discuss its limitations.	**04**
	(c)	What do you mean by tuning of controller? Explain Z-N method of tuning.	**07**
Q.5	**(a)**	Show any one configuration of ratio control scheme.	**03**
	(b)	Briefly discuss override control scheme.	**04**
	(c)	Draw the basic block diagram of feed forward control. Write the difference between feedback and feed forward control scheme.	**07**

OR

Q.5	**(a)**	Briefly explain air-fuel ratio control for drum boiler.	**03**
	(b)	Briefly explain the split range control scheme.	**04**
	(c)	Draw the basic block diagram of cascade control scheme and discuss in detail with suitable process example.	**07**