

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-V(NEW) EXAMINATION – SUMMER 2022****Subject Code:2151705****Date:13/06/2022****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.
4. Simple and non-programmable scientific calculators are allowed.

		MARKS
Q.1	(a) Define term 1) Offset 2) Dynamic Error 3) Transfer Function.	03
	(b) What is Self-Regulation? Give an example regulating process.	04
	(c) Explain the Dynamic behavior of the First and second order Processes.	07
Q.2	(a) Elaborate about servo and Regulatory system.	03
	(b) What causes inverse response? Explain with mathematical arguments.	04
	(c) Derive the transfer function of interacting two tank system with linear resistance element.	07
OR		
	(c) Derive the model for continuously stirred Tank Heater with its process loop.	07
Q.3	(a) Write seven process control objectives. Explain any one in detail.	03
	(b) How to convert nonlinear term to linear and why?	04
	(c) Explain Proportional mode of control. Draw the error vs. time curve, show the effect of K_p on offset, draw the step response of p controller for various value of K_p .	07
OR		
Q.3	(a) Differentiate between distributed and lumped parameter system with one example.	03
	(b) What do you mean by the term 'Dead Time'? What is its effect on the stability of system?	04
	(c) Explain two position controller with suitable waveform. Show the effect of neutral zone on controller output.	07
Q.4	(a) What are the features of split range control?	03
	(b) What is Integral Windup? Discuss with Example.	04
	(c) For a unity feedback system, process transfer function is given by $G(s) = 1/s(s+1)(s+5)$. The controller is of PID mode. Calculate the optimal values of controller parameter based on ultimate cycle method of tuning.	07
OR		
Q.4	(a) Can the derivative control mode can be used alone? Tell the Justification of your answer.	03
	(b) Explain gain scheduling in the context of adaptive control with suitable diagram.	04
	(c) A certain thermometer has a time constant of 15 s and initial temperature of $T_0 = 25^\circ\text{C}$. It is suddenly exposed to a temperature of 100°C . Determine the rise time i.e. time required to attain 95% of steady state value and the temperature at this time.	07

- Q.5** (a) Discuss Zero Order Hold (ZOH) in the context of digital controller. **03**
(b) Explain ratio control with suitable example. **04**
(c) Illustrate three element control of boiler drum level with block diagram and summarize it in detail. **07**

OR

- Q.5** (a) Explain open loop ZN tuning method of the PID controller. **03**
(b) Give the rules for designing and tuning cascade control. **04**
(c) Discuss with the examples, the interacting and non-interacting processes and explain in brief. **07**
