

GUJARAT TECHNOLOGICAL UNIVERSITY**BE – SEMESTER- V EXAMINATION-SUMMER 2023****Subject Code: 2151705****Date: 28/06/2023****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)	Using the example of an air conditioner (AC), explain servo and regulatory response of the control system	03
	(b)	Explain any one method for obtaining First Order Plus Time Delay (FOPTD) approximate model for processes.	04
	(c)	Derive model of a liquid level tank system.	07
Q.2	(a)	State energy balance and component balance equations	03
	(b)	What is self regulation? Give example for self regulating process	04
	(c)	What are the limitations of cascade control strategy? Discuss on tuning rule for the same.	07
OR			
	(c)	What are the features of split range control? Explain the split range control for reactor pressure control	07
Q.3	(a)	What do you mean by velocity and position algorithm for PID controller implementation?	03
	(b)	What is integrator windup? State and explain the ways to deal with the same.	04
	(c)	Explain proportional controller with suitable diagram and example of process	07
OR			
Q.3	(a)	What do you mean by tuning of controller? Explain Z-N method of tuning.	03
	(b)	Explain ratio control scheme with suitable diagram.	04
	(c)	Explain multi position controller in brief	07
Q.4	(a)	Draw and explain the step response of a PI controller	03
	(b)	What is offset in case of proportional control action? How offset can be eliminated? Explain.	04
	(c)	Give out the guidelines for digital implementation of a PID controller in detail.	07
OR			
Q.4	(a)	What are the performance criterions to design a control system?	03
	(b)	Explain linearization method for processes with nonlinear elements	04
	(c)	Describe Control Objectives for a process control with suitable example.	07

- Q.5 (a)** Define the following terms: **03**
1) Position Error
2) Dead band
3) Degree of freedom
- (b)** What causes inverse response? Explain with mathematical arguments **04**
- (c)** Explain open loop ZN tuning method of the PID controller **07**

OR

- Q.5 (a)** Explain two position controller with example. Explain the need of neutral zone **03**
- (b)** With suitable diagram explain the control scheme for maintaining proper air to fuel ratio for drum boilers. **04**
- (c)** Derive the transfer function of interacting two tank system with linear resistance element **07**