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

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject Code: 2151705 **Date: 01/05/2017**

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		**Short Questions (one mark each)**	**14**
	1	PD control is widely used for process control. True or False	
	2	Integral action is responsible for eliminating offset in proportional controller. True or False	
	3	Derivative action is used for the _____processes. (fast/slow)	
	4	Integrator wind up is associated with _____(saturation, self regulation)	
	5	Delay in the process can contribute _____on right half s-plane. (pole, zero)	
	6	Level tank is _____process. (integrating, exponential)	
	7	Cascade control can be used for any processes. True or False	
	8	Feed forward control can result in sustained oscillations. True or False	
	9	Derivative action is applied to _____(output, error) to avoid large bumps in actuator signal for step reference tracking.	
	10	Derivative action is not recommended for the processes which have _____ frequency noise in the output.(high, low)	
	11	In ratio control systems ratio station is generally kept_____the control loop. (inside, outside)	
	12	Ratio control is a special type of _____. (feedback, feed forward) control.	
	13	Shrinking and swelling are the phenomena in _____(boilers, generators, turbines)	
	14	Inverse response is caused by the right half plane _____(zero, pole) in the process transfer function.	
Q.2	**(a)**	What causes inverse response? Explain with mathematical arguments .	**03**
	(b)	Explain any one method for obtaining First Order Plus Time Delay (FOPTD) approximate model for processes.	**04**
	(c)	Explain Ziegler Nicholas Tuning method in detail.	**07**
		OR	
	(c)	Explain linearization method for processes with nonlinear elements.	**07**
Q.3	**(a)**	Give examples and explain in brief the interacting and non interacting processes.	**03**
	(b)	State energy balance and component balance equations.	**04**
	(c)	Derive the transfer function for non interacting two tank system. Assume suitable data.	**07**

OR

Q.3	**(a)**	What is self regulation? Give example for self regulating process.	**03**
	(b)	What is integrator windup? State and explain the ways to deal with the same.	**04**
	(c)	Give out the guidelines for digital implementation of a PID controller in detail.	**07**
Q.4	**(a)**	Comment on dead time or process lag. Explain its effects on system stability.	**03**
	(b)	What is offset in case of proportional control action? How offset can be eliminated? explain.	**04**
	(c)	Comment on controller bias and bump less transfer for PID controller manual and auto mode	**07**

OR

Q.4	**(a)**	Explain ratio control with suitable example.	**03**
	(b)	What are the limitations of cascade control strategy? Discuss on tuning rule for the same.	**04**
	(c)	Explain cascade control with suitable example in detail.	**07**
Q.5	**(a)**	Explain shrinking, swelling and inverse response for drum boilers.	**03**
	(b)	Explain air fuel ratio for drum boilers.	**04**
	(c)	Write the procedure to obtain second order approximate model for a given process.	**07**

OR

Q.5	**(a)**	What do you mean by velocity and position algorithm for PID controller implementation?	**03**
	(b)	Write a note on ON OFF two position controller with suitable example.	**04**
	(c)	A certain thermometer has a time constant of 15 s and initial temperature of 20°C. It is suddenly exposed to a temperature of 100°C. Determine the rise time i.e. time required to attain 90% of steady state value and the temperature at this time.	**07**

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