

Seat No.: \_\_\_\_\_

Enrolment No. \_\_\_\_\_

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE - SEMESTER-V (NEW) - EXAMINATION – SUMMER 2018****Subject Code:2151705****Date:30/04/2018****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.

		<b>MARKS</b>
<b>Q.1</b>	(a) Define dead time in process control. Give Pade's approximation for delay term in system.	<b>03</b>
	(b) Explain servo and Regulatory control system	<b>04</b>
	(c) Describe the procedure for linearization of non linear terms.	<b>07</b>
<b>Q.2</b>	(a) Differentiate between distributed and lumped parameter system with one example	<b>03</b>
	(b) Explain Multiposition controller function with error Vs controller output relation.	<b>04</b>
	(c) Derive the transfer function of interacting two tank system with linear resistance element.	<b>07</b>
<b>OR</b>		
	(c) Derive the model for continuously stirred Tank Heater with its process loop.	<b>07</b>
<b>Q.3</b>	(a) The pressure in a tank varies from 20 Psi to 100 Psi. The pressure in the tank is desired to be kept at 50 Psi. what is full scale error when pressure inside the tank is 30 Psi.	<b>03</b>
	(b) Explain Time Proportional Control with suitable waveform.	<b>04</b>
	(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 $K_p$ .	<b>07</b>
<b>OR</b>		
<b>Q.3</b>	(a) Write seven process control objectives. and explain any one in detail.	<b>03</b>
	(b) An integral controller is used for temperature control in a range of 0-250 degcen. With a setpoint of 150 degcen. At zero error, the controller output is 20%. Reset rate is -0.1%/sec/%error. If temperature jumps to 180 degcen, calculate the controller output after 5 seconds.	<b>04</b>
	(c) Explain two position controller with suitable waveform. Show the effect of neutral zone on controller output.	<b>07</b>
<b>Q.4</b>	(a) What is integral windup ?	<b>03</b>
	(b) Give the rules for designing and tuning cascade control.	<b>04</b>
	(c) The transfer function of a 3 tank system is $G(s) = \frac{6}{(2s+1)(4s+1)(6s+1)}$	<b>07</b>

Controller is proportional and all other elements have unit transfer function. Calculate the optimal values of PID Controller parameters based on ultimate cycle method of tuning.

**OR**

- Q.4** (a) Give FOPDT model of system, Show how to derive the parameters of FOPDT model from Process Reaction Curve. **03**
- (b) Give comparison of feedforward and feedback control scheme. **04**
- (c) Analyse closed control loop of level control system with Proportional mode of control. **07**
- Q.5** (a) Draw the block diagram of feed forward control for a heat exchanger. **03**
- (b) Show any one configuration of ratio control. **04**
- (c) Explain override control scheme in detail with with example of a drum boiler control. **07**
- OR**
- Q.5** (a) Draw the block diagram of cascade control scheme. **03**
- (b) Draw the block diagram of adaptive control scheme and show the steps of adaptive process control. **04**
- (c) Explain split range control scheme. **07**

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