Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – II • EXAMINATION – SUMMER • 2014

Subject code: 1720308 **Date: 23-06-2014**

Subject Name: Process Control

Time: 02:30 pm - 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.**

Q.1 **(a)** Design electronic PID controller with necessary derivations. **08**

(b) An open-loop transient test shows a pressure system to have an apparent dead time L of 0.04 minutes, a reaction rate N of 2.5 psi per minute, and a process ultimate change K of 10 psi for a change of valve setting M of 5percent. If the set point is 100psi, and the differential gap is 0.5 psi, calculate the amplitude and period of on-off control. **06**

Q.2 **(a)** Give the Proportional Integral Derivative (PID) control schematic for a single capacitance liquid level process. **07**

(b) Design a proportional- integral controller with a proportional band of 30% and an integration gain 0.1%/(%-s). The 4 to 20-mA input converts to a 0.4 to 2 V signal, and the output is to be 0-10V. Calculate values of G_P , G_I, R_2, R_1 and C respectively **07**

OR

(b) A 5m diameter cylindrical tank is emptied by a constant outflow of 1.0 m^3/min. A two position controller is used to open and close a fill valve with an open flow of 2. 0 m^3/min. For level control, the neutral zone is 1m and the set point is 12m. **07**

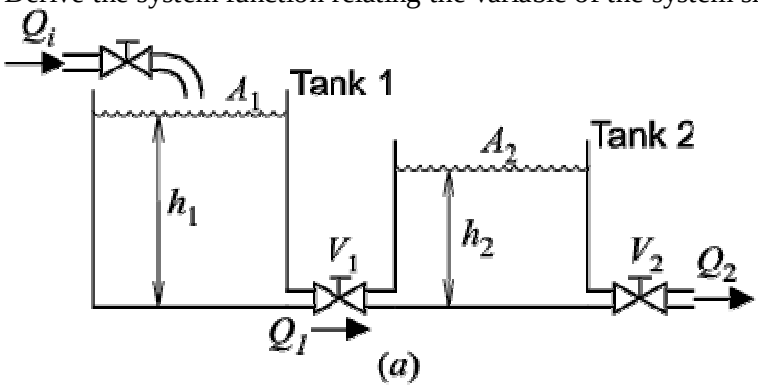
1. Calculate the cycling period.
2. Plot the level versus time.

Q.3 **(a)** Explain resistance and capacitance element of liquid level system in detail **07**

(b) Explain static error, offset and velocity error in detail. **07**

OR

Q.3 **(a)** Derive the system function relating the variable of the system shown in fig(a). **07**



(b) Explain process degree of freedom in detail. Find process degree of freedom for liquid to liquid heat exchanger. **07**

Q.4 **(a)** Explain ratio control loop with suitable example **07**

(b) Explain different distillation equipment in details and discuss about the column variables. **07**

OR

Q.4	**(a)**	Write short note on Batch process control.	**07**
Q.4	**(b)**	Explain cascade control loop with suitable example	**07**
Q.5	**(a)**	Explain any one scheme for temperature control of superheated steam in boiler.	**07**
	(b)	List the advantages and disadvantages of feedforward and feedback configuration. Give any one example where feed forward control can be easily implemented.	**07**

OR

Q.5	**(a)**	With suitable example, explain how magnitude of process load affects the performance of the control system?	**07**
	(b)	Explain ćthree element controlô of boiler drum level control.	**07**

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