Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Sem-II Examination July 2010

Subject code: 720308 **Subject Name: Process Control**

Date: 08 / 07 /2010 **Time: 11.00am – 1.30pm**

Total Marks: 60

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** What do you mean by process degree of freedom? Find out the process degree of freedom of a liquid level system with two time constants in series. **06**

(b) Explain the time constant type thermal process in details. For the air heating system, the normal air inlet flow is 250 cu ft per min at atmospheric pressure. The inlet temperature is 65 F. The volume of the heater is 425 cu ft. calculate the time constant of the process. **06**

Q.2 **(a)** What do you mean by differential gap in two position control? Explain the single speed floating control in detail. **06**

(b) What are the effects of closing the loop in the system? A controller has the following functions in series: (T_1s+1), (T_2s+1) and $1/Ts$. What parameters are determine derivative time, proportional sensitivity and integral time? **06**

OR

(b) When derivative action is used ? Explain a practical derivative mode op amp controller using circuit diagram. **06**

Q.3 **(a)** Give a comparison of Proportional, Derivative and Integral Control. If a relay feedback test on a system gives an ultimate period T_u = 1.2 seconds and ultimate gain of K_u = 4.2, then find out PID parameters using any tuning rule for this system. **06**

(b) Write short note on boiler dynamics and give the feed forward control of steam pressure. **06**

OR

Q.3 **(a)** Draw the flow sheet symbol of Distillation control and explain reboiler and interheaters/ intercoolers. **06**

(b) Explain liquid to liquid heat exchangers in details. **06**

Q.4 **(a)** What are the effects of measurement lag on the closed loop response? Write short note on batch process control. **06**

(b) What are the basic differences in feed forward and feedback control schemes?. How a disturbance can be modeled to use feed forward control? Give any one example where feed forward control can be easily implemented. **06**

OR

Q.4 **(a)** A temperature control system inputs the controlled variable as a range from 0 to 5V. The output is a heater requiring 0 to 6 V. A PID is to be used with Kp = 1.4%/%, Ki = 7.5/(%/min), Kd = 0.3%/(%/min). The period of fastest expected change is estimated to be 8 seconds. Develop the electronic PID Circit. **08**

(b) Explain Process Load and Process disturbances. **04**

Q.5	**(a)**	When Cascade control loop is very useful? How the inner controller can be tuned to get the maximum advantages? Explain cascade controller scheme for distillation column control.	**06**
	(b)	Explain the multiposition control in details? Give practical example of it.	**06**

OR

Q.5	**(a)**	Explain three element boiler control scheme	**06**
	(b)	What do you mean by ratio control? Which problems are associated with ratio control? What are the solutions?	**06**

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