Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E –IIst SEMESTER–EXAMINATION – JULY- 2012

Subject code: 1720308 **Date: 12/07/2012**

Subject Name: Process Control

Time: 10:30 am – 13:00 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)** When subjected to 10 N step force, an oscillatory linear displacement mechanical system is found to have the following response data: **06**

1) First positive peak overshoot displacement = 55 cm
2) Second positive peak overshoot displacement = 41.5 cm
3) Time between two peaks above = 1 sec
4) Final steady state displacement = 35 cm

Obtain a second order approximate transfer function for this physical system.

(b) What are the feed forward control design criterion? For a system transfer function of G(s) = e^(-15s)/ (20s +1) in which transportation lag is 15 seconds and disturbance model transfer function of Gd(s) = e^(-30s)/(20s+1) , find out transfer function of feed forward controller Gff. **08**

Q.2 **(a)** Write short note on resistance and capacitance of thermal and Gaseous system in details. **08**

(b) For a temperature measuring system, the temperature range is 0-160°C. Temperature controller is of PI type and the output of the controller is 0-10 V. PB is 40%, Ki is 1 repeat in 5 minutes, desired temperature is 80°C, and the controller output when temperature is at set point is 5 V. If the temperature drops to 60°C, calculate the controller output at the end of 1 minute in 1) Percentage and in 2) Volts **06**

OR

(b) An integral control system will have a measurement range of 0.4 to 2.0 V and an output range of 0 to 6.8 V. Design an op amp integral controller to implement a gain of Ki = 6%/(%-min). Specify the values of Gi (1/RC), R and C. **06**

Q.3 **(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. **08**

(b) What do you mean by process load? Explain magnitude of process load in details. **06**

OR

Q.3 **(a)** Write short note on optimizing or computing machine control in details. **08**

(b) How Zeigler Nichols method is useful in tuning of PID Controller? If a system having a step response of gain K of 2 , delay time of 6 sec, and time constant of 18 sec, find a suitable PID controller for the system. **06**

Q.4 **(a)** Give the Proportional Integral Derivative (PID) control schematic for a single capacitance liquid level process. **08**

(b) Explain any one method of column pressure control in distillation processes. **06**

OR

Q.4 **(a)** What do you mean by distillation condenser? Write short note on condenser controls. **08**

(b) Write short note on Batch process control. **06**

Q.5 **(a)** Explain process degree of freedom and control degree of freedom in details. Find process degree of freedom for liquid to liquid heat exchanger. **08**

(b) Explain the working of two element control scheme of a boiler. **06**

OR

Q.5 **(a)** Write short note on distillation equipment. **08**

(b) Explain multi position control in details. **06**

****