SHAHEED BHAGAT SINGH STATE TECHNICAL CAMPUS, FEROZEPUR

ROLL No: | | | | | | | | | | | | | **Total number of pages:[3]**

B.Tech. || CHE || 5th Sem(RP)
PROCESS DYNAMICS AND CONTROL
Subject Code: BTCH-503
Paper ID :N/17

Time Allowed: 3 hrs. **Max Marks: 60**

Important Instructions:

- **All questions are compulsory**
- **Assume any missing data**

PART A (10x 2marks)

Q.1.	Answer in brief:
	(a) Differentiate between feedforward and feedback control technique.
	(b) Give the physical significance of time constant and damping coefficient?
	(c) What do you understand by the term dead time? Find its Laplace transform. (d) Does a cascade control perform better response than simple feedback control system? Why? (e) What is (i) Decay Ratio (ii) Response time for an underdamped system? (f) Differentiate between servo problem and regulator problem .Give examples of each. (g) State the Ziegler- Nicolas Controller settings? (h) What is the need of process identification? Give the different process identification techniques?
	(i) A liquid tank is discharging Name the different methods of stability analysis used in process control.
	(j) What are the advantages of PID controller?

PART B (5×8marks)

Q. 2. A thermometer having first order dynamics with a time constant of 1 min is placed in a temp. bath at 100^0 F . After the thermometer reaches steady state, it is suddenly placed in a bath at 110^0 F and left there for 1 min., after which it is immediately returned to the bath at 100^0 F. CO_1

a. Draw a sketch showing the thermometer the variation of the thermometer reading with time.

b. Calculate the thermometer reading at t = 0.5 min. and t = 2.0 min.

OR

Differentiate between interacting and non- interacting systems. Derive a transfer function for Interacting system?

38

Q. 6. a. With the help of a block diagram explain the functioning of a cascade control system .Does a cascade control provide better response than simple feedback control system ? Why? CO5

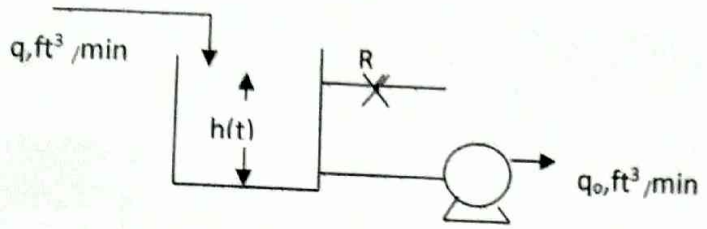
b. How can you select indicating and recording instruments for chemical industries. Give one example of each?

OR

a. What is the need of process identification? Give the different process identification techniques? CO5

b. Discuss the dynamics and control of Distillation Column?

Q. 3. A liquid level system as shown below has a cross sectional area of 3.0ft² .The valve characteristics are $q = 8\sqrt{h}$,where q= flow rate cfm and h= level above the valve, ft. Calculate the time constant for this system if the average operating level is (a) 3 ft (b) 9 ft CO2



OR

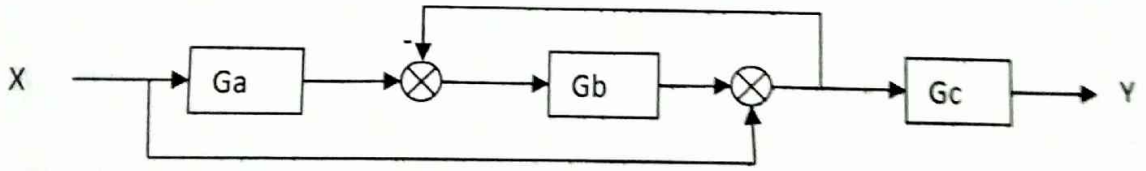
Consider PI control of an overdamped second order process(time constants in min) CO2

$G_p(s) = \frac{5}{(s+5)(0.5s+1)}$, $G_m = G_v = 1$, where G_m ,G_v and Gm are the transfer functions for process, final control element and measuring element respectively. Show that τ_I = 1min results in stable close loop system for all positive values of K_c.

Q. 4. a) Classify the various types of controllers. Also give advantages and disadvantages of them. CO3

OR

Determine the transfer function Y(s)/X(s) for the block diagrams shown. express the results in terms of Ga, Gb and Gc CO3



Q. 5. State Bode Stability Criterion. A control system with a P controller has an open loop transfer function $G(s) = \frac{2e^{-2s}}{(s+1)}$ .Obtain the crossover frequency a ultimate controller gain. Given time is in mins CO4

OR

Write the characteristic equation and construct the Routh array for the control system shown in fig. below. Is the system stable for (a) Kc = 9.5 (b) Kc = 11 and (c) Kc = 12 ? CO4