UPES, Dehradun
End Semester Examination, April-May 2024

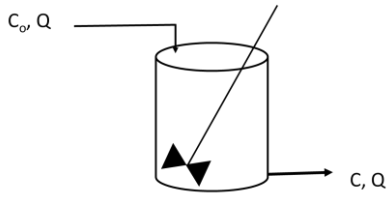
Program Name	**: B. Tech. APE Gas**	**Semester**	**: VI**
Course Name	**: Process Dynamics Instrumentation and control**	**Time**	**: 3 hours**
Course Code	**: CHGS 3028**	**Max. Marks: 100**	
Nos. of page(s)	**: 02**		

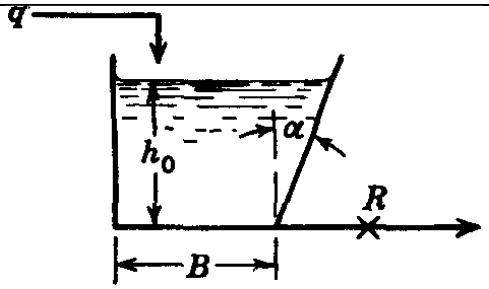
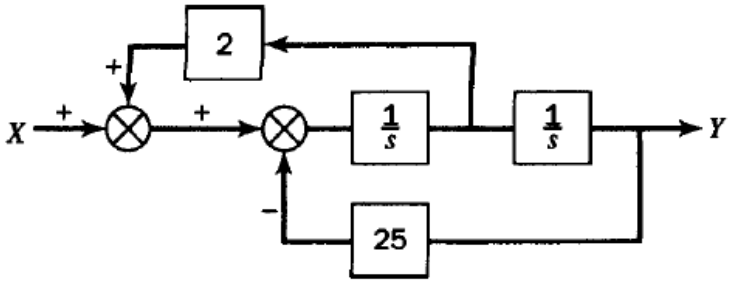
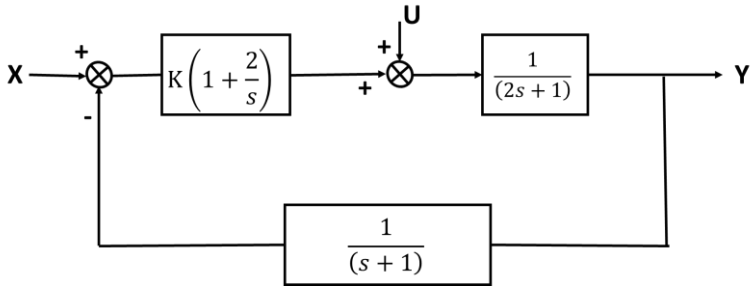
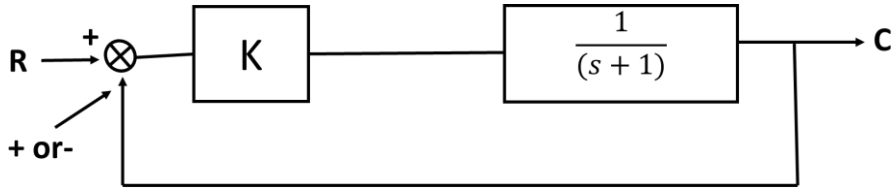
Instructions : Assume any missing data. Draw the diagrams, wherever necessary

SECTION A
(5QX4M=20 marks)

S. No.		Marks	CO
1	***Identify*** the terms used in underdamped second order system.	**4**	**CO1**
2	***List*** the assumptions used in the mercury in glass bulb thermometer model.	**4**	**CO1**
3	***Describe*** damping.	**4**	**CO2**
4	***Summarize*** Routh stability criterion.	**4**	**CO2**
5	***Dramatize*** the way the root locus is plotted.	**4**	**CO3**

SECTION B
(4QX10M=40 marks)

6	Solve the following differential equations using Laplace Transforms. $\frac{dx}{dt} - x = 2sint \qquad x(0) = 0$	**10**	**CO1**
7	Consider the stirred tank reactor given here.  The reaction occurring is A--→B and proceeds at a rate of r=KC Where r is moles of A reacting /(volume) (time) K is reaction rate constant C(t) is the concentration of A in the reactor V is the volume of the reactor Q is the volumetric flow rate Co is the concentration of A in the feed stream. Assuming the constant density and volume, ***Outline*** the transfer function relating the concentration of A in the reactor to feed stream using physics of the problem.	**10**	**CO2**
8	***Demonstrate*** a formula for finding the time constant of the liquid-level system shown below, when the average operating level is h,. The resistance R is linear. The tank has three vertical walls and one which slopes at an angle α from the vertical as shown in figure. The distance separating the parallel walls is 1.	**10**	**CO3**

			
9	***Reduce*** the given block diagram and find Y/X 	**10**	**CO3**
	SECTION C **(2Q X 20M=40 marks)**		
10	***Analyze*** the stability of the following system for Kc=1,2 and 3. For any value of Kc if the system is on verge of instability condition, evaluate the roots of the characteristic equation for which the system goes to instability.  **OR** ***Compare*** the responses to a unit-step change in set point for the system shown below, for a negative feed back system. Do this for Kc=0.5 and 1. 	**20**	**CO4**
11	***Plot*** the root locus for the open loop transfer function. $\frac{K(s+3)}{s(s+1)(s+2)(s+4)}$	**20**	**CO5**