Total number of printed pages: **02**

B.Tech(UG)/6th /UIE604

2024

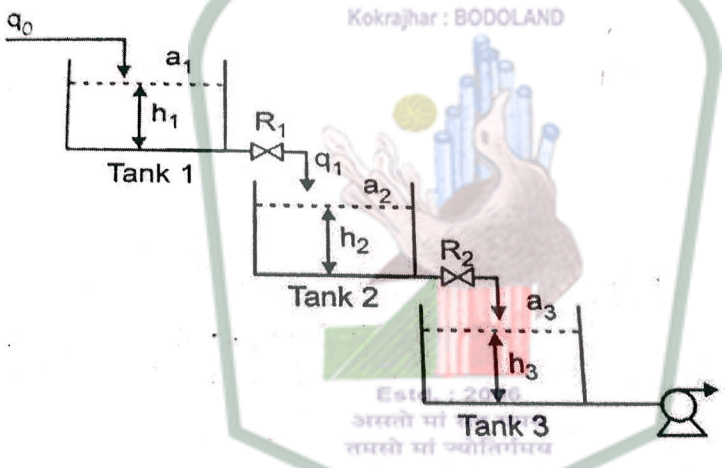
Process Control and Instrumentation

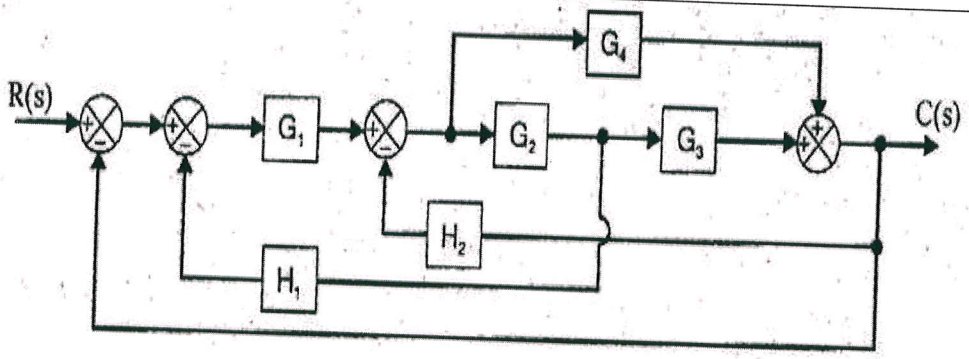
Full Marks: 100

Time: Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1.	a)	Define the term process control & what are the need of process control?	5
	b)	Explain the process variables with a suitable example?	5
	c)	Derive the transfer function of the liquid level system shown below (fig.01).  Figure 01	10
2.		List the advantages and disadvantages of ON-OFF, P, PI, PD and PID control modes. Also draw its characteristics in supporting to the above.	20
3	a)	Obtain the expression of unity feedback system whose open loop transfer function G(s) given below and when the input is unit step. $$G(s) = \frac{4}{s(s+5)}$$	10
	b)	The expression of a closed loop system is $c(t) = 1-0.4\ e^{-50t}-1.4\ e^{10t}$ when subject to a unit step input. Determine the undamped natural frequency and damping ratio.	10
4.	a)	Obtain the closed loop transfer C(s)/R(s) of the system whose block diagram is shown in fig. 02.	10

		 Figure 02	
	b)	A unity feedback system has the forward transfer function G(s), when the input is r(t) = 1+6t. Determine the value of K_1 so that the steady state error is equal to 0.1. $$G(s) = \frac{K_1(2s+1)}{s(5s+1)(1+s)^2}$$	10
5.	a)	The forward path transfer function of a unity feedback control system is given by, $$G(s) = \frac{25}{s(s+5)}$$ Find the natural frequency, damping ratio, rise time, percentage overshoot and settling time.	10
	b)	What are the standard test signals? Depending on the value of damping ratio, how the second order systems are classified?	10
6.	a)	What is the Seebeck effect, and what are the laws of thermocouples? Explain the construction and working principle of thermocouples.	10
	b)	A feedback system has open loop transfer function of G(s). Determine the maximum value of K for stability of closed loop system. $$G(s) = \frac{K(1-s)}{s(s^2+5s+9)}$$	10
7.	Write short notes on the following (with diagram if applicable)		5x4= 20
	a)	Define the term temperature? Convert the temperature -20 °C into degree kelvin, Fahrenheit & Rankine.	
	b)	Convert 10 kg/cm^2 into mm WG, mm Hg, bar, psi & torr units	
	c)	C shape bourdon tube	
	d)	McLead Guage	

****THE END****