CBCS SCHEME - Make-Up Exam

USN | | | | | | | | | | |

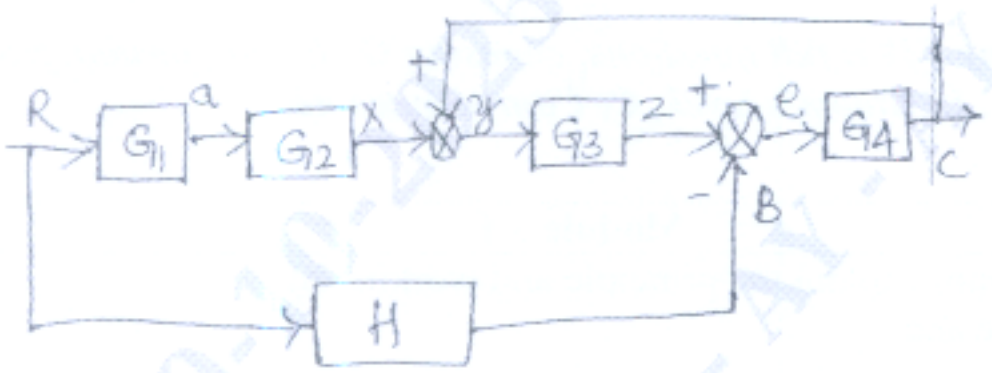
BBT601

Sixth Semester B.E/B.Tech. Degree Examination, June/July 2025
Bioprocess Control and Automation + Lab

Time: 3 Hrs. Max. Marks:100

Note: *1. Answer any FIVE full questions, choosing ONE full question from each module.*
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
1	a.	With neat diagram, explain the principle and working of i) Thermocouple and ii) RTD	10	L2	CO1
	b.	Describe the online methods for biomass estimation.	10	L2	CO1
		OR			
2	a.	With a neat sketch, explain the working principle of i) Diaphragm gauge and ii) Bourdon tuble	10	L2	CO1
	b.	Explain the measurement of physical and chemical parameters.	10	L2	CO1
		Module – 2			
3	a.	Obtain the transfer function for liquid level single tank system.	12	L2	CO2
	b.	A thermometer having a time constant of 10 seconds is placed in a temperature batch. After the thermometer reaches steady state temperature of 30°C, it is suddenly placed into a hot fluid at 60°C, Sketch the response of the thermometer.	8	L3	CO2
		OR			
4	a.	Obtain the sinusoidal response for the first order transfer function.	12	L2	CO2
	b.	A thermometer is observed to extubit the first order dynamics having the time constant of 12 s and is placed in water bath. After the thermometer reaches steady state temperature of 30°C with the water bath, temperature of the bath is linearly increased with time at a rate of 6°C/ min Obtain the response for the thermometer at 5 sec, 10 sec and 15 sec. Determine the dynamic error and time lag of the system.	8	L3	CO2
		Module – 3			
5	a.	Obtain the transfer function for three tank non interacting liquid level system.	10	L2	CO2
	b.	The overall T.F of the control system is given as $G(s)=\frac{16}{1.5s^2+2.4s+6}$ A step change of magnitude 6 is introduced into the system. Determine : i) Overshoot ii) Period of Oscillation iii) Natural period of Oscillation iv) Rise time v) Ultimate Value of response vi) Maximum value of response	10	L3	CO2

		OR			
6	a.	Obtain the Transfer function for U – tube Manometer	**10**	**L2**	**CO2**
	b.	Derive a step response for the second order system.	**10**	**L3**	**CO2**
		Module – 4			
7	a.	With a neat sketch, explain pneumatic control valve.	**10**	**L2**	**CO3**
	b.	Determine the overall transfer function c(s) / R(s) for the system shown in figure.  Fig. Q. 7(b)	**10**	**L3**	**CO3**
		OR			
8	a.	Derive the transfer function for servo problem with neat block diagram.	**12**	**L2**	**CO3**
	b.	A unit step change is given to a PI controller. If the proportional sensitivity or gain (K_c) is 4, integral time is 2, obtain the response of PI controller.	**8**	**L3**	**CO3**
		Module – 5			
9	a.	Sketch the root locus diagram for the system, if the open loop T.F is $G(s)=\frac{kc}{s(s+1)(s+2)}$	**10**	**L4**	**CO4**
	b.	Obtain the bode diagram for first order system.	**10**	**L4**	**CO4**
		OR			
10	a.	A PD controller having derivative time. τ_D = 4 is used to control two non-interacting first order systems with τ_1= 1 and τ_2 = 0.5 Gain of the system is 0.5. Determine the stability of the control system.	**10**	**L4**	**CO4**
	b.	The open loop transfer function of control system is given as $G(s)=\frac{K_c(0.5s+1)}{s(s+1)(s+0.5)}$. Sketch the root locus diagram of the control system. Indicate the open loop poles, zero, break away point. Determine the value of gain of the controller K_c for which the system becomes just unsalable.	**10**	**L4**	**CO4**

* * * * *