Register No : _____

THE KAVERY ENGINEERING COLLEGE

(An Autonomous Institution)

B.E/B.TECH DEGREE END SEMESTER THEORY EXAMINATIONS, NOV/DEC 2025

Sixth Semester

Chemical Engineering

CH3651 – Process Dynamics and Control

Regulations - 2021

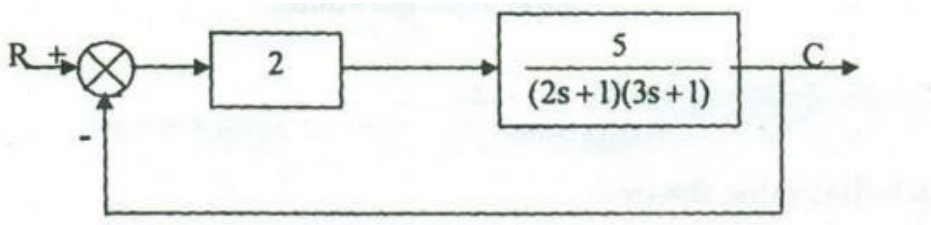
Duration : 3 Hrs *Maximum : 100 Marks*

*PART – A (ANSWER ALL QUESTIONS) (Marks 10*2=20)*

Q.No	*Questions*	*BLT*	*CO*	*Marks*
1.	Find the Laplace transform of f(t) = sin(2t).	L2	1	2
2.	Define forcing function.	L1	1	2
3.	Explain linearization of nonlinear system.	L2	2	2
4.	Define decay ratio.	L1	2	2
5.	Distinguish between servo and regulatory control.	L2	3	2
6.	What is off set?	L1	3	2
7.	Define the term cross over frequency.	L1	4	2
8.	Define amplitude ratio and phase lag.	L1	4	2
9.	When feed forward control system is used?	L1	5	2
10.	What are the controlled variables in a binary distillation column?	L1	5	2

*PART – B (ANSWER ALL QUESTIONS) (Marks 5*16 = 80)*

Q.No			*Questions*	*BLT*	*CO*	*Marks*
11.	a	i	Solve the following Laplace Transform: $d^2x/dt^2 + x = \sin t$.	L4	1	8
		ii	Classify the forcing functions used to study the dynamic system of response.	L1	1	8
			Or			
	b	i	Find the initial value of the function that has the following transform: $$x(s) = \frac{s^4-6s^2+9s-8}{s(s-2)(s^3+2s^2-s-2)}$$	L4	1	8
		ii	A thermometer having a time constant of 0.1 min at a steady state temperature of 90°F, at time t = 0, the thermometer is placed in a temperature bath maintained at 100°F. Determine the time needed for the thermometer read to read 98°F.	L4	1	8
12.	a	i	Explain the response of a first order system to a step input.	L3	2	8
		ii	Derive the transfer function of mixing tank.	L3	2	8
			Or			

	b	A step change of magnitude 4 is introduced into a system having the transfer function: $$\frac{Y(s)}{X(s)} = \frac{10}{s^2 + 1.6s + 4}$$ Determine: (a) Percent overshoot (b) Rise Time (c) Maximum value of Y(t) (d) Ultimate value of Y(t) (e) Period of osicillation	L3	2	16
13.	a	For the control system shown in figure. With R =2/s. Determine:  (i) C(s)/R(s) (ii) C(∞) (iii) Offset (iv) C(0.5)	L3	3	16
		Or			
	b i	Estimate the stability of the system whose characteristic equation is given by: $S^5 + 2S^4 + 5S^3 + 10\ S^2 + 4S + 8 = 0$.	L3	3	10
	ii	Explain the merits and demerits of Routh Test.	L3	3	6
14.	a	Consider the feedback control system with open loop transfer function given as: $GH(s) = K_c\ e^{-5s}\ /(s+1)(3s+1)$. Using Bode's Stability criteria, calculate the value of K_c at which the closed loop system becomes unstable.	L4	4	16
		Or			
	b	Consider the feedback control system with open loop transfer function given as: $GH(s) = K_c / S(S+1)(2S+1)$. Sketch the Nyquist plot using Nyquist stability criteria, calculate the limiting value of K_c at which the closed loop system becomes unstable.	L4	4	16
15.	a	Explain the Cascade control and Feedforward control system with neat sketch.	L2	5	16
		Or			
	b i	Explain various control schemes used for the control of heat exchanger.	L2	5	8
	ii	Explain various control schemes used for the control of binary distillation column.	L2	5	8