Ref. No. - Ex/CHE/PC/B/T/322/2024
B.E Chemical Engineering Third Year 2nd Semester Exam-2024
Department of Chemical Engineering, Jadavpur University

Subject: Process Dynamics and Control (**CHE/PC/B/T/322**)

Time: 3 hr | Full Marks: 100

(Attempt all questions)

		Marks
	CO1	
Q1	Point out the controlled variable, manipulate variable, controller, set point, sensor, final control element and disturbances in case of a human being driving a car through sketch. How to diminish the disturbances in this control system?	10
	CO2	
Q2	Solve the solving following differential equation by Laplace transform $\frac{d^4x}{dt^4} + \frac{d^3x}{dt^3} = \cos t\,; \quad x(0) = x'(0) = x'''(0) = 0 \; and \; x''(0) = 1$	15
Q3	Consider a second order system with the following transfer function? $G(s) = \frac{Y(s)}{f(s)} = \frac{1}{s^2+s+1}$ Introduce a step change of magnitude one into the system and find (i) % overshoot, (ii) decay ratio, (iii) rise time, (iv) ultimate value of Y(t).	15
Q4	Estimate the transient response of a liquid level while ramp change in input for a first order process	15
	CO3	
Q5	a) Determine the range of K for stability of the system with following characteristic equation $s^4 + Ks^3 + s^2 + s + 1 = 0$	10
	b) Determine the stability by Routh criterion for the system with following characteristic equation $s^4 + 3s^3 + 5s^2 + 4s + 2 = 0$	10
Q6	Derive the offset value for Proportional controller during servo problem and regulator problem.	15
	CO4	
Q7	Simplify the block diagram then obtain the close-loop transfer function C(s)/R(s)	10

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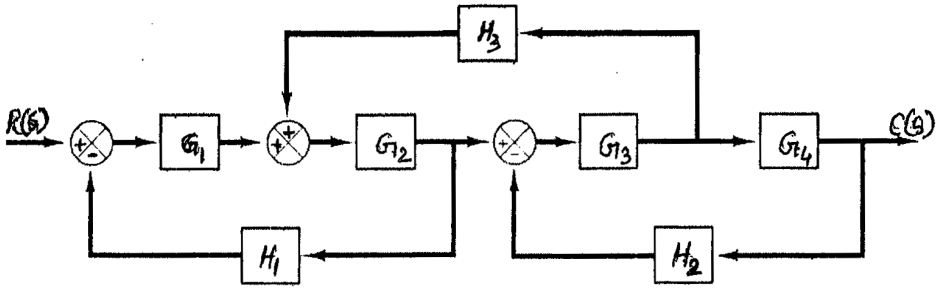
R(s)
G1
G2
G3
G4
C(s)
H1
H2
H3