U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

August 2024 Supplementary Examinations

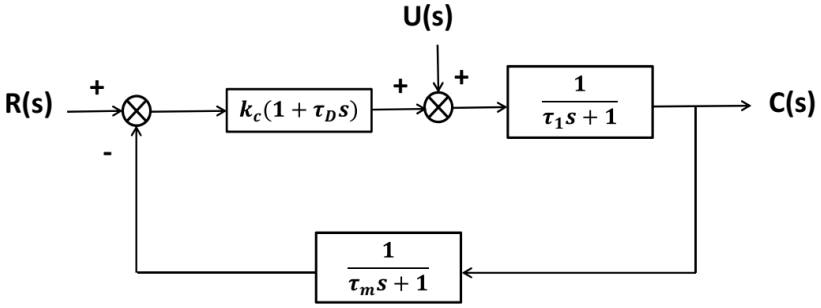
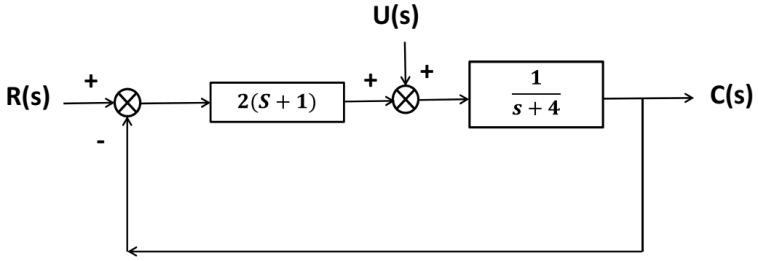
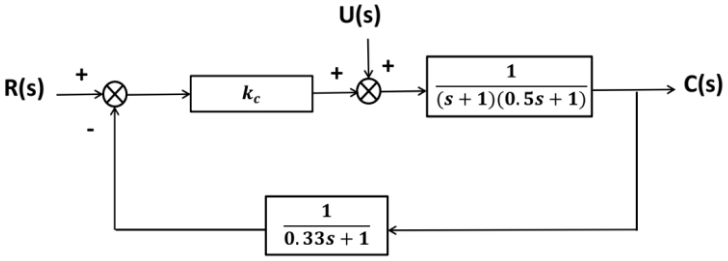
Programme: B.E. **Semester: IV**
Branch: Chemical Engineering **Duration: 3 hrs.**
Course Code: 19CH5DCPCE **Max Marks: 100**
Course: Process Control Engineering

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

SUPPLEMENTARY EXAMS 2024

				Marks
			UNIT - I	
	1	a)	Develop the overall transfer function $H_2(s)/Q(s)$ for the liquid system, in which two tanks of cross sectional areas (A_1 and A_2) and Resistances (R_1 and R_2) are non-interacting with each other. Assume the flow resistances are linear.	**10**
		b)	A tank having cross sectional area of 0.3 m^2. The steady state flow rate is 0.6 m^3/min is subjected to a step change of magnitude 0.05 m^3/min. The time constant for the tank is 1 min. Determine the liquid level in the tank at t = 1 min.	**10**
			UNIT - II	
	2	a)	Derive the expression for a critically damped second order system when a step input is applied to it.	**10**
		b)	A step change of magnitude '2' is introduced into a system having the transfer function. $$G(s) = \frac{2}{s^2 + 2s + 4}$$ Calculate (i) Overshoot, (ii) Decay ratio, (iii) Cyclic frequency (iv) Radian frequency.	**10**
			OR	
	3	a)	Determine Y(0), Y(0.6) and Y(1) for the following transfer function. Plot the response. $$Y(s) = \frac{25}{s(s^2 - 5s + 4)}$$	**10**
		b)	Describe the transfer function for transportation lag by considering a liquid flows through an insulated tube of uniform cross-sectional area A and length L at a constant volumetric flow rate q. Enlist the approximations for this transfer function.	**10**
			UNIT – III	
	4	a)	Write a short note on the following. (i) Draw the block diagram of simple control system and label all the components. (ii) Negative v/s positive feedback controller	**06**
		b)	Describe Pneumatic control valve with the help of neat diagram.	**08**

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

		c)	Explain Servo and Regulator problem in a control system.	**06**
			UNIT - IV	
	5	a)	A Proportional Derivative controller is used for the control of first order system having time constant, τ_1 = 30 sec. The value of gain of PD controller is k_c = 6 and τ_D = 4 sec, τ_m = 6 sec. If a step magnitude of 0.16 is given to the load variable. Determine offset?  	**10**
		b)	A control system is shown in figure. Determine the variation of output response, C(t) for a unit step change given to the set point?  	**10**
			UNIT -V	
	6	a)	Consider the following control system. Find the value of k_c for which the system is stable and also find the roots of the characteristic equation?  	**12**
		b)	How do you determine the stability of the control system using Routh test? Explain?	**08**
			OR	
	7	a)	The open loop transfer function of negative feedback control system is given below. Sketch the root locus. $$G(s) = \frac{k_c e^{-4s}}{(s+3)(s+6)}$$	**12**
		b)	Explain Ziegler-Nichols and Cohen-Coon tuning parameters for stability analysis.	**08**

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