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

Autonomous Institute Affiliated to VTU

September / October 2023 Supplementary Examinations

Programme: B.E. **Semester: V**
Branch: Chemical Engineering **Duration: 3 hrs.**
Course Code: 19CH5DCPCE **Max Marks: 100**
Course: Process Control Engineering **Date: 19.09.2023**

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

UNIT - I

1	a)	Demonstrate the process by which we can determine the time constant of any first order system with the help of a specific example.	**10**
	b)	Derive the impulse responses of a first order system. Explain the response with the aid of the response plot.	**10**

UNIT - II

2	a)	Justify the representation of a U-tube manometer by a second order system. Mention the assumptions made.	**10**
	b)	A step change of magnitude 4 is introduced into a system having the transfer function. $Y(s) / X(s) = 10 / [s^2 + 1.6s + 4]$ i) Plot the response as a function of time. ii) Determine the rise time. iii) Determine the response time.	**10**

OR

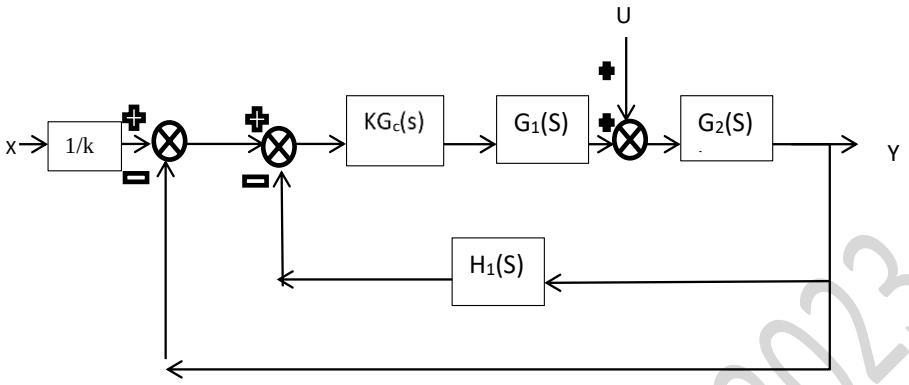
3	a)	Derive the step response of an under-damped second order system.	**10**
	b)	Describe the transportation lag with a suitable example. Derive its transfer function. Enlist the approximations for this transfer function.	**10**

UNIT - III

4	a)	Differentiate servo and regulator control. List two specific applications of each.	**05**
	b)	With the help of a neat sketch, explain the function of a valve positioner.	**05**
	c)	With the help of the relevant transfer function derivation and response plot, illustrate the significance of derivative time of a proportional integral (PD) controller.	**10**

UNIT - IV

5 a) Determine Y(s)/X(s) for the control system shown in the figure below: **10**



b) Illustrate with the help of the relevant derivation and response sketches, how we can manipulate the response of a first order system for load change using PI control. **10**

UNIT - V

6 a) Define gain margin and phase margin with the necessary sketches. **06**

b) Explain Bode stability criterion. **04**

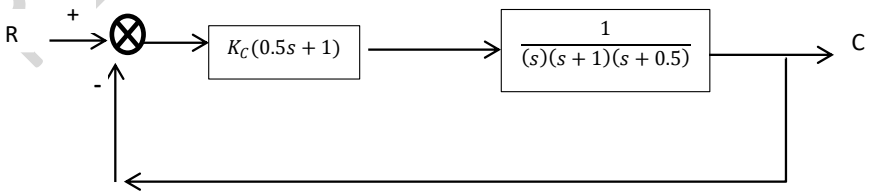
c) Plot the root locus for the open loop transfer function. **10**

$$G(s) = K(s+1) / \{s^2 (s+9)\}$$

OR

7 a) For the control system shown below, determine the following: **10**

i) Value of controller gain which causes instability.
ii) Location of the roots on the imaginary axis.



b) How is Ziegler Nichols tuning done? Explain in detail with the help of the table of tuning parameters. **10**

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