Reg. No.												

11 JAN 2023

Question Paper Code	11616

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV/DEC 2022

Fifth Semester

Instrumentation and Control Engineering

(Common to Electronics and Instrumentation Engineering)

20ICPC501 - PROCESS CONTROL

(Regulations 2020)

Duration: 3 Hours | Max. Marks: 100

PART - A (10 × 2 = 20 Marks)

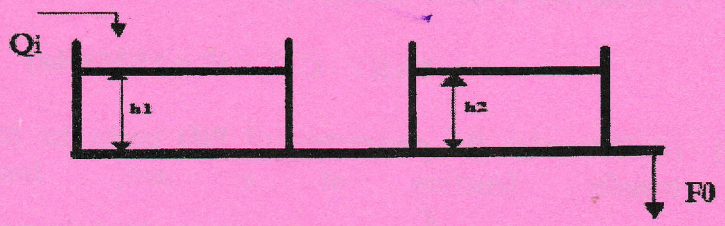
Answer ALL Questions

		Marks, K-Level, CO
1.	Define process variable, load variable and manipulated variable.	*2,K1,CO1*
2.	Differentiate between lumped and distributed parameter models.	*2,K2,CO1*
3.	Define the functions of an actuator.	*2,K1,CO2*
4.	Differentiate fail to open and fail to close control valves.	*2,K2,CO2*
5.	Define integral windup.	*2,K1,CO3*
6.	Design an electronic p-controller with a proportional gain 5.	*2,K2,CO3*
7.	Define evaluation criteria and list out the performance indices.	*2,K1,CO4*
8.	Explain how self-tuning control is achieved.	*2,K2,CO4*
9.	Mention the three elements that need to be controlled in a boiler feed water system.	*2,K2,CO5*
10.	Define Multi loop control.	*2,K1,CO5*

PART - B (5 × 13 = 65 Marks)

Answer ALL Questions

11. a) Find the transfer function of $H_2(s)/Q_i(s)$ for the liquid level system shown. *13,K2,CO1*



OR

b) Obtain the mathematical model of a Continuous Stirred Tank Reactor (CSTR) with neat sketch and necessary equations. *13,K2,CO1*

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create

12. a) Compare the working of different types of control valves with their inherent and installed characteristics. *13,K2,CO2*

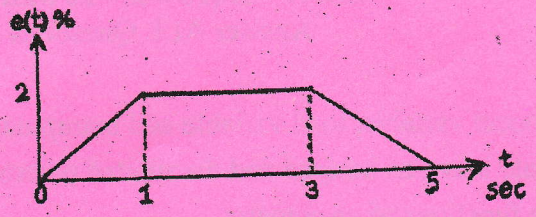
OR

b) How control valve sizing is done for a flow process application and explain the factors involved in selection of a control valve. *13,K2,CO2*

13. a) Explain the characteristics of an on-off controller with neat diagrams. *13,K2,CO3*

OR

b) Draw the plot of PID controller output for the following error pattern. Kp=2; integral time=1 second and derivative time=0.5 second. P(0)=5% *13,K2,CO3*



14. a) (i) Discuss the procedure for optimizing controller parameters using time response methods. *7,K2,CO4*

(ii) Illustrate about the tuning of a PID controller based on Cohen Coon Process reaction curve method with necessary formulations. *6,K2,CO4*

OR

b) (i) Explain the damping oscillation method for tuning classical PID controller. *7,K2,CO4*

(ii) With neat diagram explain the cascade control scheme with an example. *6,K2,CO4*

15. a) Explain the steps involved in designing a IMC-PID Control scheme for a first order and second order process. *13,K2,CO5*

OR

b) Explain with block diagram the implementation of multi loop control schemes for a Heat Exchanger process. *13,K2,CO5*

PART - C (1 × 15 = 15 Marks)

16. a) (i) Determine the parameters of PID controller for the open loop transfer function of a unity feedback system $G(s)H(s)=\frac{K}{S(S^2+6s+9)}$ using Zieglar Nichols method. *8,K3,CO4*

(ii) Explain how Split Range control scheme is adopted for a process application. *7,K2,CO5*

OR

b) (i) Determine the parameters of PID controller for the open loop transfer function of a unity feedback system $G(s)H(s)=\frac{K}{S(S+50)}$ using Cohen Coon method. *8,K3,CO4*

(ii) Explain with necessary diagrams, the working of Smith predictor control scheme. *7,K2,CO5*