Reg. No.															

Question Paper Code	13669

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2025

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 (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	In servo operations, what is the primary goal? (a) To maintain a constant set point (b) To correct disturbances (c) To vary set points (d) To minimize energy use	1	K1	CO1
2.	A process in which the materials or work are stationary at one physical location is _____. (a) continuous process (b) batch process (c) regulator operation (d) servo operation	1	K1	CO1
3.	Positioning controllers are used for _____. (a) low loads (b) temperature changes (c) high loads (d) flow rate changes	1	K1	CO2
4.	In linear control valve, the stem position varies linearly with _____. (a) velocity (b) differential pressure (c) flow rate (d) displacement	1	K1	CO2
5.	Which type of controller increases the stability of the system by keeping it at a consistent setting? (a) On-Off (b) Proportional (c) Integral (d) Derivative	1	K1	CO3
6.	Integral action will lead to _____. (a) peak overshoot (b) no offset (c) delayed response (d) faster the response	1	K1	CO3
7.	The _____ is reasonable trade-off between fast rise time and reasonable setting time. (a) ISE (b) IAE (c) ITAE (d) one quarter decay ratio	1	K1	CO4
8.	The _____is control scheme acts before the disturbance is felt by the process. It is good for slow systems. (a) cascade control (b) feed forward control (c) ratio control (d) inferential control	1	K1	CO4
9.	In a three-element control system, which variable is controlled to maintain a stable drum level? (a) Drum temperature (b) Drum pressure (c) Feed water flow (d) Steam flow	1	K1	CO5
10.	In multi-loop control scheme, which of the following control types is used to maintain a fixed relationship between two or more process variables? (a) Cascade control (b) Ratio control (c) Feed forward control (d) Split-range control	1	K1	CO5

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

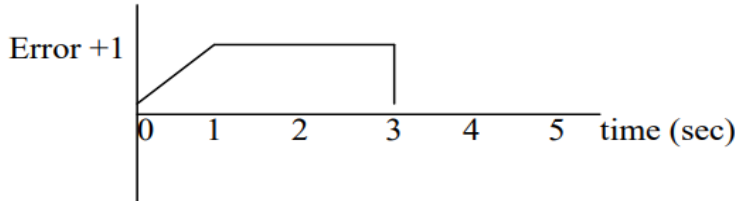
		Marks	K – Level	CO
11.	List the key objectives of process control.	2	K1	CO1
12.	Compare servo and regulator operation.	2	K2	CO1
13.	Differentiate between interacting and non-interacting systems with examples.	2	K2	CO1
14.	Define control valve sizing.	2	K1	CO2
15.	State the need for a valve positioner.	2	K1	CO2
16.	Classify the four types of control valve.	2	K1	CO2
17.	List any two merits and demerits of PID controllers.	2	K1	CO3
18.	Write the expression for output of PID controller.	2	K2	CO3
19.	What is controller tuning?	2	K1	CO4

20.	Define one quarter decay ratio.		2	K1	CO4
21.	State the steps in designing internal model controller.		2	K2	CO5
22.	Identify any two types of continuous dryers.		2	K2	CO5

PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

23.	a)	Develop the mathematical model of first order transfer function of a liquid level system.	11	K2	CO1
		OR			
	b)	Derive the transfer function for continuous stirred tank reactor.	11	K2	CO1
24.	a)	Explain the principle of direct and reverse acting pneumatic actuators with suitable example.	11	K2	CO2
		OR			
	b)	Summarize the following terms: (i) Cavitation (ii) Flashing	11	K2	CO2
25.	a)	Estimate the characteristics of ON-OFF and single speed floating controllers.	11	K2	CO3
		OR			
	b)	Given the error values in the Figure, plot a graph of a P+I controller output as a function of time. Assume $K_P = 5$, $K_I = 1.0$ Sec^{-1} and $P_I(0) = 20\%$.	11	K2	CO3



26.	a)	Explain cascade controller with neat diagram.	11	K2	CO4
		OR			
	b)	Choose the controller settings using Ziegler-Nichols continuous cycling method and write its limitations.	11	K2	CO4
27.	a)	Explain the control schemes involved in the heat exchanger process with neat sketch.	11	K2	CO5
		OR			
	b)	Explain the operation of IMC controller with neat diagram.	11	K2	CO5
28.	a) (i)	Briefly explain the $\frac{1}{4}$ decay ratio method.	6	K2	CO4
	(ii)	Draw and describe the P&I diagram for a boiler drum level control.	5	K2	CO5
		OR			
	b) (i)	Explain the operation of feed forward control with suitable example.	6	K2	CO4
	(ii)	Summarize the multi- loop control schemes.	5	K2	CO5