Reg. No.																

Question Paper Code	14596

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2026

Fifth Semester

Electronics and Instrumentation Engineering

20ICPC501 - PROCESS CONTROL

Regulations - 2020

Duration: 3 Hours | Max. Marks: 100

PART – A (i) (MCQ)
(16 × 1 = 16 Marks)
Answer ALL Questions

		Marks	K – Level	CO
1.	In a non-interacting two tank system. a) Flow between tanks depends on both tank levels b) Tanks behave independently c) Tanks have same level always d) No outlet flow exists	1	K1	CO1
2.	The main purpose of process variable is commonly controlled in a heat exchanger. a) Density b) Temperature c) Viscosity d) Humidity	1	K1	CO1
3.	Servo operation mainly applied with a) Disturbance rejection b) Maintaining constant output c) Tracking set point changes d) Flow measurement	1	K3	CO1
4.	A valve positioner is used to a) Measure flow rate b) Improve valve positioning accuracy c) Increase tank level d) Reduce process gain	1	K1	CO2
5.	Equal percentage valve characteristic demonstrates: a) Constant flow change b) Exponential flow relation c) Linear pressure drop d) Constant valve gain	1	K3	CO2
6.	Cavitation in control valves occurs due to a) High temperature b) Vapor bubble formation and collapse c) Low viscosity d) Excess lubrication	1	K2	CO2
7.	The application of ON-OFF control action in process control is for a) Precision control systems b) Temperature control in household appliances c) Multivariable systems d) Advanced control loops	1	K3	CO3
8.	Bumpless transfer investigates on a) Smooth switching between manual and auto mode b) Fast controller response c) Reduced pressure drop d) Stable valve operation	1	K3	CO3
9.	The other name of Floating control mode is a) Two position control b) Velocity control c) Adaptive control d) Feed-forward control	1	K1	CO3
10.	Ziegler-Nichols tuning method is based on a) Frequency analysis b) Trial and error c) Ultimate gain and period d) Valve sizing	1	K2	CO4

11.	The IAE abbreviated as		*1*	*K2*	*CO4*
	a) Integral Absolute error	b) Internal Auto error			
	c) Instrument Accurate error	d) Integrate Analog error			
12.	The implementation of Feedforward control demonstrates		*1*	*K3*	*CO4*
	a) Output error only	b) Measured disturbances			
	c) Manual adjustment	d) Valve characteristics			
13.	IMC-based PID tuning generally provides		*1*	*K1*	*CO5*
	a) Aggressive oscillations	b) Stable and robust performance			
	c) Manual operation	d) Increased dead time			
14.	Multi-loop control schemes are used for:		*1*	*K2*	*CO5*
	a) Single variable systems only	b) Complex interacting systems			
	c) Manual processes	d) Open-loop systems			
15.	The main advantage of Smith Predictor applied on		*1*	*K3*	*CO5*
	a) Reduces valve size	b) Improves control of dead time processes			
	c) Eliminates sensors	d) Reduces actuator cost			
16.	The requirement of Model based control applies on		*1*	*K2*	*CO5*
	a) Accurate process model	b) Manual valve operation			
	c) No sensors	d) only On- Off Control			

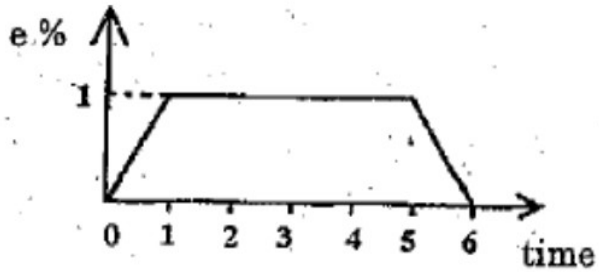
PART – A (ii) (Short Answer Questions)
(8 × 3 = 24 Marks)
Answer ALL Questions

17.	Compare and contrast the difference between servo and regulatory operations using a suitable process.	*3*	*K3*	*CO1*
18.	Investigate the effect of interaction in multi-tank systems.	*3*	*K4*	*CO1*
19.	Apply valve sizing concepts to determine suitable valve selection for a flow process.	*3*	*K3*	*CO2*
20.	Distinguish between cavitation and flashing in terms of physical phenomenon and impact.	*3*	*K4*	*CO2*
21.	Illustrate the operation of ON-OFF control with an industrial example.	*3*	*K3*	*CO3*
22.	Demonstrate the effect of integral action in eliminating offset.	*3*	*K3*	*CO4*
23.	Demonstrate the implementation of feed-forward control in industries.	*3*	*K3*	*CO4*
24.	Investigate the performance of IMC control systems.	*3*	*K4*	*CO5*

PART - B (Descriptive Answer Questions)
(5 × 12 = 60 Marks)
Answer ALL Questions

25.	a)	Compare and implement the Continuous and batch processes with the help of suitable example.	*12*	*K3*	*CO1*
		OR			
	b)	Apply mathematical modeling techniques to derive the dynamic equation of a non-interacting process and determine its transfer function.	*12*	*K3*	*CO1*
26.	a)	Illustrate the operation of a pneumatic actuator with neat sketch.	*12*	*K3*	*CO2*
		OR			
	b)	Demonstrate the inherent and installed characteristics of control valves for different industrial applications.	*12*	*K3*	*CO2*

27. a) Sketch the PID controller output for the given error signal shown in the following Figure. Given that KP = 5, KI = 0.7sec, KD = 0.5 sec and PI(0) = 20%. *12* *K3* *CO3*



OR

b) Examine the practical forms of PID controllers and explain their implementation in process industries. *12* *K3* *CO3*

28. a) Analyze the performance indices ISE, IAE, and ITAE for evaluating PID controller performance. *12* *K4* *CO4*

OR

b) Analyze the effectiveness of cascade control schemes in improving process performance. *12* *K4* *CO4*

29. a) Differentiate and analyze conventional PID control and Smith Predictor control schemes. *12* *K4* *CO5*

OR

b) Investigate the effectiveness of three-element boiler drum level control in maintaining process stability. *12* *K4* *CO5*