GURU NANAK INSTITUTE OF TECHNOLOGY
An Autonomous Institute under MAKAUT
2022
PROCESS CONTROL-1
EI601

TIME ALLOTTED: 3 HOURS   FULL MARKS: 70

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable

GROUP – A
(Multiple Choice Type Questions)
Answer any *ten* from the following, choosing the correct alternative of each question: 10×1=10

|			Marks	CO No.
1.	(i)	Which controller cannot be used alone? a) P controller b) I controller c) D controller d) ON-OFF controller	1	CO1
	(ii)	In three element boiler drum level control which kind of control is used a) Feedback control b) Cascade Control c) Feedforward control d) all of them	1	CO3
	(iii)	The feedback system is unsatisfactory for a) fast process b) sluggish process c) any one of the process d) none of these	1	CO3
	(iv)	Ratio Control is a special type a) feedback control b) feed forward control c) cascade control d) none of these	1	CO3
	(v)	Tight shut off is not present in a) single seated valve b) double seated valve c) butterfly valve d) gate valve	1	CO4
	(vi)	Flapper –Nozzle system is used in a) electronic controller b) pneumatic controller c) hydraulic controller d) none of these	1	CO1

(vii) In Cascade Control the controller for secondary loop is   1   CO3
a) P controller
b) PI controller
c) PID controller
d) I controller

(viii) DCS consists of   1   CO4
a) local controllers
b) interconnected digital data link
c) co-ordinating controller
d) all the above

(ix) Which type of isolator is generally used in I/O module of PLC?   1   CO4
a) Electrical isolator
b) Optiical isolator
c) Magnetic isolator
d) Electronic isolator

(x) Good control of a process is achieved by adjusting the amplitude ratio to   1   CO2
a) 1/2
b) 1/4
c) 1/ 8
d) 1

(xi) If the Proportional Band of P controller is adjusted to minimum possible   1   CO1
value, then the controller will act as
a) ON/OFF controller
b) Integral controller
c) Derivative controller
d) any one of the above

(xii) The term reset control refers to: 1   CO1
a) Proportional
b) Integral
c) Derivative
d) None of the above

GROUP – B
(Long Answer Type Questions)
(Answer any *three* of the following) 3 x 5 = 15

		Marks	CO No.
2.	Draw & explain the basic block diagram of process control.	3	CO1
3.a.	What is Feedforward Control?	3	
b.	What are the advantages & Disadvantages of this Control?	2	CO4
4.	Valve A is linear with a flow scale factor of 20 m^3/hr per percent controller output. The controller output is nominally 50% with KP= 1% / %.A load change occurs when the flow through valve B changes from 500 m^3/hr to 600 m^3/hr .Set point is at 6 m and the liquid level can vary from 1-13 m. Calculate the new level upon load change	5	CO1
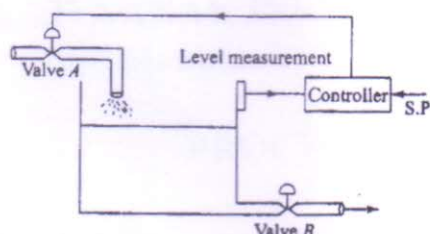
5.	Explain the working principle of Ratio control.	5	CO2
6.	Explain working principle of Safety valve.	5	CO4

GROUP – C
(Long Answer Type Questions)
(Answer any *three* of the following) 3 x 15 = 45

		Marks	CO No.
7. a)	Draw and explain the working principle of Electronic PI controller.	5	CO1
b)	Design a PI controller with a proportional band of 30% and an integration gain of .1%/(%-s). The 4-20 ma input converts to 0.4V to 2V signal and the output is to be 0V to 10 V.	4	CO1
c)	Explain the working principle of pneumatic controller and derive the equation of control action.	6	CO1
8.a)	What do you mean by tuning of controllers? What is ¼ th decay ratio?	4	CO2
b)	What are the different methods of tuning of controllers?	2	CO2
c)	What is process reaction curve? How is it obtained? Sketch the S- curve and show the parameters which are used for controller tuning.	5	CO2
d)	In the Ziegler- Nichols method, the critical gain was found to be 4.2, and the critical period was 2.21 min . Find the standard setting for PID control.	4	CO2
9.a)	What is Cascade control ? Draw the block diagram of cascade control. With a suitable example explain the function of Cascade control.	7	CO3
b)	Explain the working principle of a Drum level control system.	8	CO3
10. a)	Explain the working principle of control valve.	5	CO4
b)	Explain the cavitation and flashing phenomena with the help of a diagram.	3	CO4
c)	Draw and explain the working principle of I/P converter.	4	CO4
d)	Define c_v and k_v of Valve. Inlet pressure of a particular fluid handled is 40 psia , outlet pressure is 20 psia and vapour pressure is 16 psia. Calculate the application ratio and predict the chances of cavitation and flashing.	3	CO4
11.a)	Explain the working principle of DCS with a schematic.	5	CO4
b)	Explain scan time and response time of PLC.	2	CO4
c)	Develop the PLC ladder diagram for controlling a heating oven. The system is started with a start button and this can be stopped by a stop button. When the start button is pressed, a horn for the first 10 secs to warn that the oven will start and subsequently the horn stops and the heating coil start. When stop button is pressed, oven is turned off, but the fan continues to blow for another 5 minutes before turning off.	8	CO4