GURU NANAK INSTITUTE OF TECHNOLOGY
An Autonomous Institute under MAKAUT
2020-2021
PROCESS CONTROL SYSTEM
EI(FT)701B

TIME ALLOTTED: 3 Hrs   **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)	Transfer function of a system is defined as a) Output/ Input b) Input/Output c) Laplace transform of Output/Laplace transform of Input when all initial conditions are zero d)Laplace transform of Input/Laplace transformOutput of when all initial conditions are zero	1	CO1
(ii)	Which of the following controllers has maximum offset a) P controller b) PD controller c) PID controller d) I controller	1	CO2
(iii)	Tight shut off is not present in a) single seated valve b) double seated valve c) butterfly valve d) gate valve	1	CO4
(iv)	Reset rate is another term used for _____ time a) derivative b) integral c) dead d) none of these	1	CO2
(v)	What is the type of a system whose transfer function is $G(S)= 5/S^2(S^2+ 5S+6)$ a) Type 0 ,Order 2 b) Type 2, Order 2 c) Type 2,Order 4 d) Type 1,Order 4	1	CO1
(vi)	Which controller cannot be used alone a) P controller b) I Controller c) D Controller d) All of these	1	CO2

| (vii) | Stabilization time is minimum in | 1 | CO2 |

(vii) Stabilization time is minimum in   1   CO2
  a) I controller
  b) PD controller
  c) PID controller
  d) PI controller

(viii) Find the total transfer function of the system.   1   CO1
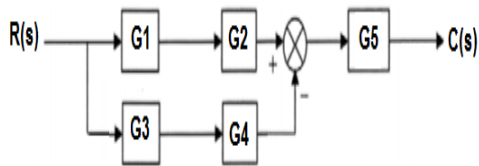
  a) (G1.G2 - G3.G4).G5
  b) (G1.G2 + G3) - G4.G5
  c) (G1 + G2).G3 + (G4 + G5)
  d) G1.G2 + G3.G4 – G5

(ix) V-port type valve is used for   1   CO4
  a) decreasing sensitivity
  b) increasing sensitivity
  c) linear sensitivity
  d) all the above

(x) Bevelled disc type valve is used for   1   CO4
  a) decreasing sensitivity
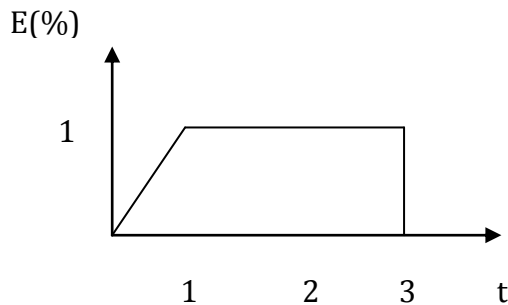 b) increasing sensitivity
  c) linear sensitivity
  d) all the above

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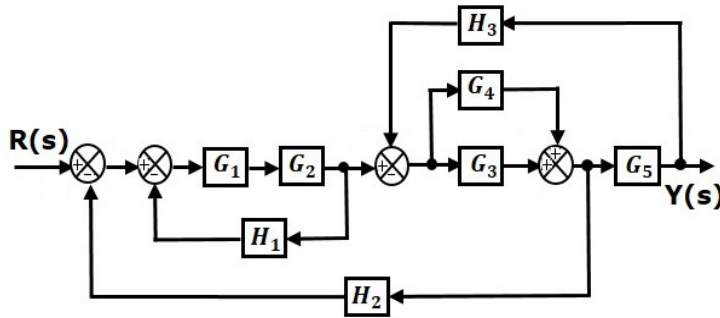(Answer any *three* of the following)   **3 x 5 = 15**

		Marks	CO No
2.	Plot the graph of a PI controller output as a function time. The error to the controller is shown in fig. Kp=5, KI=1.0 s-1, PI(0)=20%.	5	CO2

| 3. | Plot the graph of a PI controller output as a function time.The error to the controller is shown in fig. Kp=5, KI=1.0 s-1, PI(0)=20%. | 5 | CO2 |

|			
4.	Find the overall Transfer of the system.	5	CO1

5.	"Actuator power required for a single seated valve is greater than the double seated valve". Justify the statement with proper diagram.	5	CO4
6.	Design an electronic integral controller of input range 6V,an output of 5V and KI of 3.0%/%-min	5	CO 2

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

		Marks	**CO No**
7.a)	What are the operational aspects of instrument system?	5	CO1
7.b)	Find out the overall transfer function of the system using block diagram reduction algebra	7	CO1
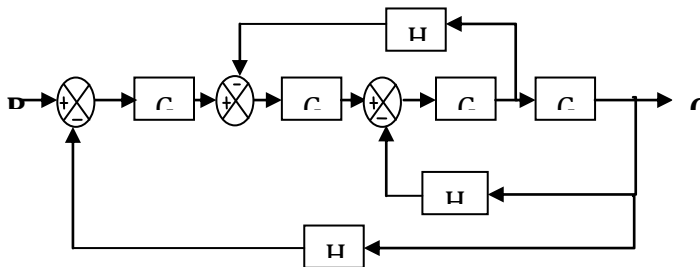
7.c)	For the transfer function given below find out i) poles & zeros of the system ii) order & type of the system $G(S)=(S^2 + 1)/S(S^2 + 3S + 2)(S+6)$	3	CO1
8. a)	A water tank is gradually losing heat and its temperature drops by 2°K per minute. When the heater is on, the system gains temperature at 4° K per minute. A two position controller has a .5 minute control lag and a neutral zone of±4% about a set point of 323° K. Plot the temperature versus time graph and find the oscillation period. Assume at t=o, temperature is at set point and the heater is off	7	CO2
8. b)	What is rangeability? Explain the cavitation and flashing phenomena with the help of a diagram.	5	CO4

8. c)	Calculate Cv&Kv of the valve for the system shown in figure which regulates the flow of glycerine. Specific gravity of glycerine is 1.4.	3	CO4
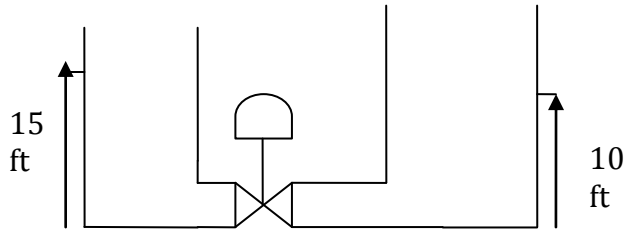
9. a)	What is a Feed forward system, explain briefly. What are the advantages and disadvantages of the system?	5	CO3
9. b)	What is Cascade Control? Explain with example.	5	CO3
9. c)	Explain one Scheme of Ratio Control& its application.	5	CO3
10.a)	Why valve- positioner is required with an actuator? Explain the operating principle of a valve positioner.	7	CO4
10. b)	What is valve sizing? Define Cv and Kv.	5	CO4
10.c)	A valve with a Cv rating of 4.0 is used to throttle the flow of glycerine for which specific gravity relative to error (G) is 1.26. Determine the maximum flow through the valve.	3	CO4
11.	Write short notes on any three:	3x5	
11.a)	Spring actuator with positioner	5	CO4
11.b)	Ratio Control	5	CO3
11.c)	Feedforward control	5	CO3
11.d)	Solenoid as actuator	5	CO4
11.e)	Safety valve	5	CO4