BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

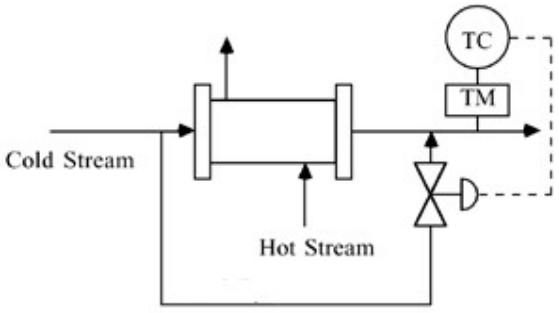
CLASS: MTech **SEMESTER : II**
BRANCH: ECE **SESSION : SP/2023**

SUBJECT: EC563 PROCESS CONTROL

TIME: 3 Hours **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

			CO	BL
1.(a)		[5]	1	3



Mention the control strategy involved in this process. Find out the process gain. Check whether the control valve is air to open or air to close type. Modify the process diagram using feed forward controller.

1.(b)	Design the mathematical model of the Isothermal chemical reactor using component material balance.	[5]	1	2
2.(a)	Find the output of the process using IMC If $g_p(s) = \frac{-3s+1}{(2s+1)(4s+1)}$, the model is uncertain and there is no disturbance. $\bar{g}_p(s) = \frac{3s+1}{(2s+1)(4s+1)}$ Use all pass factorization and filter coefficient λ=1.	[5]	2	4
2.(b)	Compare between IMC and PID controller. Find out the relationship between the closed loop controller and open loop controller.	[5]	2	3
3.(a)	Draw the basic block diagram of a cascade control system. Find out the closed loop transfer function of the cascade control system. Write down the thumb rule for implementation of the cascade control system.	[5]	3	2
3.(b)	Define relative gain array (RGA). Find out the elements of RGA matrix. Find out the relationship between each element.	[5]	3	2
4.(a)	With suitable diagram explain the operation of recycler.	[5]	4	3
4.(b)	A reactor volume of 300 moles and a reaction rate constant of 0.6 hr^{-1} . If the make-up feed stream flow rate is 120 moles/ hour calculate the recycler feed stream flow rate. If you want to get the steady state output flow rate to 150 moles/hour, what will be the makeup feed stream flow rate and the recycler flow rate.	[5]	4	3
5.(a)	With suitable diagram explain the application of process control in thermal power plant.	[5]	5	3
5.(b)	With suitable diagram explain the application of process control in catalytic cracking.	[5]	5	3

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