Register Number:……..

KUMARAGURU
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B.E DEGREE EXAMINATIONS: NOV/DEC 2022

(Regulation 2018)

Fifth Semester

ELECTRONICS AND INSTRUMENTATION ENGINEERING

U18EII5201 Process Dynamics and Control

COURSE OUTCOMES

CO1: Identify the basic principles & importance of process control in industrial process plants. (K3)
CO2: Develop the mathematical model of the process to design the control. (K3)
CO3: Design and tune process (PID) controllers. (K3)
CO4: Distinguish the characteristics of different types of Control Strategies. (K3)

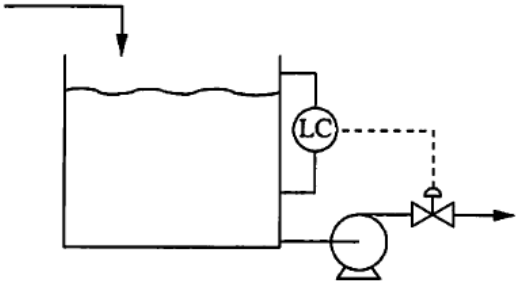
Time: Three Hours **Maximum Marks: 100**

Answer all the Questions: -

PART A (10 x 2 = 20 Marks)

(Answer not more than 40 words)

1.	What is the need for Process Control?	CO1	[K_2]
2.	Illustrate the process of self-regulation with an example.	CO1	[K_2]
3.	Consider the process shown in the below figure. Identify the input and the output variables.	CO1	[K_2]



4.	Differentiate between Servo & Regulatory operations	CO2	[K_1]
5.	Why derivative control is not recommended alone for any process?	CO2	[K_2]
6.	Write the difference between a SISO system and a MIMO system.	CO2	[K_2]
7.	Write the limitation of the ON/OFF control mode.	CO3	[K_1]
8.	List the different methods of controller tuning.	CO3	[K_1]
9.	List the advantages and disadvantages of a feed-forward control scheme	CO4	[K_1]
10.	Differentiate the instrument tags FC-135 & TC-288.	CO4	[K_2]

Answer any FIVE Questions: -
PART B (5 x 16 = 80 Marks)
(Answer not more than 400 words)

11.	a)	Elaborate in detail about the process control documentation with the necessary diagram.	8	CO1	[K_2]
	b)	Develop feedback control and feed forward control systems for controlling the temperature of the liquid inside the stirred tank, which is heated by steam passing through the steam coil immersed inside the tank.	8	CO1	[K_2]
12.	a)	Determine the state variables and state equations of the Stirred Tank Heater (STR) system and obtain the mathematical model of the system.	12	CO2	[K_2]
	b)	Differentiate between Batch & Continuous process.	4	CO2	[K_2]
13.	a)	Develop a mathematical model for a liquid-level system where the inlet flow is regulated to achieve a steady state.	12	CO2	[K_2]
	b)	Enumerate the effects of different controller parameters (K_P, K_I, K_D) on the closed-loop response of a system with respect to load disturbances.	4	CO2	[K_2]
14.	a)	Obtain the transfer function $\frac{h_2(s)}{q_1(s)}$ for the non -interacting tank system.	8	CO2	[K_2]
	b)	Illustrate the application of the digital control system with the necessary diagram.	8	CO4	[K_2]
15.	a)	Discuss in detail the various steps involved in the process reaction curve method of controller tuning. Tabulate the expressions for the "best" controller settings developed by Cohen & Coon.	8	CO3	[K_2]
	b)	Explain Ziegler-Nichols tuning of PID with relevant diagram.	8	CO3	[K_2]
16.	a)	Discuss in detail the cascade control scheme with a neat block diagram. Illustrate the same with an example.	8	CO4	[K_2]
	b)	Discuss in detail the Model predictive control with the necessary diagram.	8	CO4	[K_2]

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