Question Paper Code: 56903A

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2021

Sixth Semester

Chemical Engineering

15UCH603 - PROCESS INSTRUMENTATION DYNAMICS AND CONTROL

(Regulation 2015)

Duration: 1:45 hours Maximum: 50 Marks

PART – A (10 X 2 =20 Marks)
ANSWER ANY TEN QUESTIONS

1.	How the viscosity is measured?	U	CO1
2.	How humidity of gas is measured?	U	CO1
3.	Using electrical conductivity, which parameters can be measured?	AN	CO1
4.	Define rangeability of a control valve.	U	CO2
5.	Write the transfer function of a PID controller	U	CO2
6.	Write the transfer function of a PI controller	U	CO2
7.	Define load and set point	AN	CO3
8.	Explain the mechanism of control valve	U	CO3
9.	List any two advantages and disadvantages of pneumatic controller	AN	CO3
10.	What do you meant by bode diagram?	AN	CO4
11.	Define static error of an instrument.	R	CO4
12.	State Laplace transform. Mention its applications in process control study.	U	CO4
13.	Differentiate between servo problem and regulatory problem.	R	CO5
14.	What are Bode diagrams? Give its physical significance.	AN	CO5

15.	Write notes about smith predictor control strategy.	U	CO5

ANSWER ANY THREE QUESTIONS

PART - B (10 X 3 =30 Marks)

1	Explain the various dynamic characteristics of a measuring instrument.	AN	CO1
2	Develop the transfer function for a first-order system by considering the unsteady-state behavior of an ordinary mercury-in-glass thermometer.	AP	CO2
3	The temperature sensing element for the stirred-tank heater is a thermocouple. The manufacturer's specifications state that the thermocouple has a response time of 45 s (with the response time defined by the manufacturer as the time required for the thermocouple's reading to be 90 percent complete after a step change). Assuming that the thermocouple behaves as a first-order system, determine the transfer function for the temperature measuring element.	AP	CO3
4	(i) Plot the root-locus diagram for the open-loop transfer function: $G = K / [(s+1) (s+2) (s+3)]$ (ii) Sketch the Bode plot for the following transfer function and determine gain and phase margin $G(s) = 75 (1+ 0.2s) / [s(s^2 + 16s + 100)]$	EV	CO4
5	Explain with a diagram, the application of different control loops as applicable for a distillation column	AP	CO5