Question Paper Code: 56903A

B.E. / B.Tech. DEGREE EXAMINATION, AUGUST 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.	Define static error of an instrument.	**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.	Differentiate between servo problem and regulatory problem.	**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 corner frequency?	**R**	**CO4**
12.	Define ‘Decibels’ in control theory.	**U**	**CO4**
13.	List out the advantages of a advantages of a microprocessor based controllers.	**R**	**CO5**
14.	Write notes about smith predictor control strategy. .	**AN**	**CO5**

15.	What is an analog to digital converter?	**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	(i) In PID controller the error is subjected to step change of magnitude 5. The integral time is τ_1 1 min and derivative time τ_D is 0.5 min. The sensitivity of controller Kc=1. Obtain the response equation of controller. (ii) A proportional controller with an input range of 90˚C -100˚C for the output range of 30-90 KN/m^2. The error is subjected to unit impulse change. Obtain the response equation of the proportional controller.	**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 the development of closed-loop transfer functions for: cascade control system and feed forward control system.	**AP**	**CO5**