Reg. No. : | | | | | | | | | | |

Question Paper Code: 56903

B.E. / B.Tech. DEGREE EXAMINATION, DEC 2020

Sixth Semester

Chemical Engineering

15UCH603 - PROCESS INSTRUMENTATION DYNAMICS AND CONTROL

(Regulation 2015)

Duration: 1.15 hrs Maximum: 30 Marks

PART A - (6 x 1 = 6 Marks)

(Answer any six of the following questions)

1. Which of the following category of instruments does Calipers, micrometers, scales, measuring tapes, lasers come under CO1- R

   (a) Mechanical (b) Electrical (c) Electronic (d) Absolute

2. _____ is used for the measurement of moisture in gases. CO1- R

   (a) Psychrometer (b) pH meter (c) Pirani gauge (d) Sonometer

3. Given a differentiable function f defined near a, the linearization of f at a is the linear function given by L(x) = CO2- R

   (a) $f(a) + \dot{f}(a)(x - a)$ (b) $f(a) + \dot{f}(a)(x + a)$ (c)) $f(a) + f(a)(x - a)$ (d) $f(a)+ \dot{f}(a)(x + a)$

4. If the step response of a second-order system is critically damped, the value of damping coefficient (ζ) is _____. CO2- R

   (a) < 1 (b) > 1 (c) Infinity (d) 1

5. The controller that continuously detects the difference between a process measurement and its set-point, and produces an output air signal of 3 to 15 psi . CO3- R

   (a) Electronic (b) Electrical (c) Pneumatic (d) Hydraulic

6. The output signal from proportional controller is directly proportional to CO3- R

   (a) Offset (b) Rise time (c) Error (d) Static gain

7. The Process Reaction Curve method of tuning is otherwise called CO4- R

   (a) Cohen Coon (b) Ziegler Nicholas (c) Tyreus-Luyben (d)Quarter decay

8. Routh test cannot be used to test the stability of a control system containing _____. CO4- R

(a) Transportation lag (b) Phase margin (c) Overshoot (d) Decay ratio

9. Choose the control configuration that measures the disturbance directly and takes control action to eliminate its impact on the process output CO5- R

(a) Feedback (b) Feed forward (c) Cascade (d) Ratio

10. An example for mass storage device in computer control system is ___. CO5- R

(a) Printers (b) Magnetic tapes (c) Registers (d) Card reader

PART – B (3 x 8= 24 Marks)

(Answer any three of the following questions)

11. List and explain each of the static characteristics of measuring instruments. CO1- U (8)

12. A mercury thermometer having a time constant of 0.1 min is placed in a temperature bath at 100°F and allowed to come to equilibrium with the bath. At time t =0, the temperature of the bath begins to vary sinusoidally about its average temperature of 100°F with an amplitude of 2°F. If the frequency of oscillation is 10/ p cycles/min, plot the ultimate response of the thermometer reading as a function of time. Analyze the phase lag. CO2- Ana (8)

13. A unity feedback control system has an open loop transfer function G(s) $=\frac{5}{s(s+1)}$. Find the rise time, peak overshoot, peak time, settling time for a step input of 10 units. CO3- App (8)

14. Draw the Bode diagram of the transfer function $(s) = \frac{5(1+3s)}{s(s^3+0.4s+1)}$. Also comment on the stability of the system. CO4- U (8)

15 Explain how smith predictor is used as dead-time compensating tool in chemical processes. CO5- Ana (8)