Seat No: _____ **Enrollment No: _____**

PARUL UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

B.Tech. Summer 2018- 19 Examination

Semester: 6 **Date: 30/04/2019**

Subject Code: 03103351 **Time: 10:30 to 1:00 PM**

Subject Name: Instrumentation & Process Control **Total Marks: 60**

Instructions:

1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

Q.1 Objective Type Questions. **(15)**

1. On-off control which is a special case of proportional control, has a band width of about_____ percent.
(A) 100 (B) 75 (C) 25 (D) 0

2 "A control system is unstable, if the open loop frequency response exhibits an amplitude ratio exceeding unity at the crossover frequency." This is _____ criterion.
(A) Bode stability (B) Nyquist (C) Routh stability (D) None of these

3. Bode diagram are generated from output response of the system subjected to which of the following input?
(A) Impulse (B) Step (C) Ramp (D) Sinusoidal

4. If response of a control system is to be free of offset and oscillation, the most suitable controller is
(A) Proportional controller (B) Proportional-derivative (PD) controller
(C) Proportional-integral (PI) controller (D) Proportional integral-derivative (PID) controller

5. Asymptotes are the straight lines radiating from
(A) Open loop pole (B) Break in point
(C) Centre of gravity (D) Break away point

6. Define negative and positive feedback system.

7. Draw generalized diagram of feedback control system.

8. Define response time.

9. The overall transfer function for non-interacting two tank liquid level system having individual transfer function $G_1(s)$ and $G_2(s)$ is given by _____.

10. Write the transfer function of an ideal proportional plus reset controller.

11. The roots of the characteristics equation lie to right of the imaginary axis of the complex plane the system is _____.

12. Float and shaft instruments are used to measure_____.

13. The offset for proportional controller having gain K for unit step change is given to first order system is given by _____.

14. Ionization and bellows gauges are used to measure _____ pressure.

15. The error required to move the pneumatic control valve from fully closed to fully open is known as

(A) proportional band (B) proportional error

(C) proportional variable (D) proportional control.

Q.2 Answer the following questions. (Attempt any three) **(15)**

(A) Explain why two interacting capacities have more sluggish response than two equivalent but non-interacting capacities.

(B) A proportional controller having gain Kc is used to control two non-interacting liquid tank Having time constants $\tau 1 = 1$ and $\tau 2 = 0.5$ for unity feedback control system. Determine the stability of the system using Routh criterion.

(C) Discuss the effect of Integral control on the response of the controlled process.

(D) Define Overshoot, Decay ratio, response time, rise time, period of oscillation.

Q.3 (A) The overall transfer function of the control system is given by **(8)**

$$\mathbf{G(S) = \frac{16}{1.5s^2+2.4S+6}}$$

A step change of magnitude 6 is introduced into the system determine:

1) overshoot 2) period of oscillation 3) Natural period of oscillation 4) Ultimate value

5) Maximum value of response

(B) Sketch the asymptotic Bode diagram of proportional Derivative controller system**.** **(7)**

OR

Sketch the asymptotic Bode diagram of proportional integral controller system.

Q.4 (A) A proportional derivative controller having the gain Kc and the derivative time is 4 used to controller two first order systems having time constant $\tau 1 = 1$ and $\tau 2 = 0.5$. If the gain of the process is 0.5. sketch the root locus diagram for the control system. The transfer function of the measuring element is $\frac{1}{S}$. (08)

OR

(A) What are the types of measurement used in process control and give the name of five temperature Measurement instruments and range. **(8)**

(B) Explain the working principle of radiation pyrometer and optical pyrometer. (07)