

PARUL UNIVERSITY
FACULTY OF ENGINEERING & TECHNOLOGY
B.Tech. Winter 2022-23 Examination

Semester: VII
Subject Code: 203103403
Subject Name: Instrumentation & Process Control

Date: 06-10-2022
Time: 10.30 am to 1.00 pm
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 - (Fill in the blanks, one word answer, MCQ-not more than Five in case of MCQ) (All are compulsory) (Each of one mark) (15)

1. The pressure range of beryllium-copper spring is _____
 (a) 900 psi (b) 10000 psi (c) 1000 psi (d) 100 psi
2. The simplest of the direct devices for liquid level measurement by _____
 (a) Bob and tape (b) Hook type level indicator (c) Float type level indicator (d) Ultrasonic
3. The variable chosen to represent the state of the system is _____
 (a) Process control (b) Controlled variable (c) Input element (d) controller
4. A control system has the following transfer function $F(s) = [(s - 1)(s + 1)]/[s(s - 2)(s + 4)]$
 The initial value of the corresponding time function is
 (a) 1 (b) 1/8 (c) 7/8 (d) -1
5. The time constant of a first order process with resistance R and capacitance C is
 (a) R + C (b) R - C (c) RC (d) 1/RC
6. Draw generalized diagram of feedback control system.
7. What do you mean by final control element?
8. List down some industrial Temperature Indicators
9. What is a first order system?
10. Draw the figure of control Valve.
11. Gas chromatography is used for the measurement of Concentration. (True/False)
12. Vapor pressure thermometers is not suitable for distant reading up to 60 meters. (True/False)
13. A constant volume gas thermometer employing _____ is used to measure sub-zero (i.e., $< 0^{\circ}$ C) temperature.
14. Close Loop system is _____ Accurate than open loop system.
15. For a over damped system Damping factor is _____.

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

- A) Discuss need and requirements of Process control.
- B) Discuss types of control configuration.
- C) Explain in brief about Generalized process control system.
- D) Define positive and negative feedback.

Q.3 A) Write in detail about Bode stability criteria . (07)

- B) Determine Laplace Transform of Exponential, Ramps & Trigonometric function. (08)

OR

- B) Explain Bimetallic thermometer in detail with figure. (08)

Q.4 A) A thermometer having a time constant of 1 min is initially at 50 deg C. it is immersed in a bath maintained at 100 deg C at t = 0 . Determine the temperature reading at 1.2 min. (08)

OR

- A) Differentiate between interacting and non-interacting system for two tanks Multi-capacity control system. (07)

- B) A thermometer having a time constant of 0.2 min is placed in a temperature bath and after the thermometer comes to equilibrium with the bath, the temperature of the bath is increased linearly with time at the rate of 1 deg C / min what is the difference between the indicated temperature and bath temperature (a) 0.1 min (b) 10. Min after the change in temperature begins. (c) What is the maximum deviation between the indicated temperature and bath temperature and when does it occurs. (d) Plot the forcing function and the response on the same graph. After the long enough time but how many minutes does the response lag the input? (08)