USN | | | | | | | | | | 18BT61

Sixth Semester B.E. Degree Examination, June/July 2024
Process Control and Automation

Time: 3 hrs. | Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1. a. Briefly outline the principle of working of the instrumentation used to measure flow measurement and discuss with the neat diagram an instrument with their working and its applications. **(10 Marks)**
   b. With outline diagram, explain flow injection analysis for measurement of substrates, products and other metabolites. **(10 Marks)**

OR

2. a. Briefly outline the principle of working of the instruments used to measure the pressure measurement and discuss with the neat diagram of an instrument with their working and application. **(10 Marks)**
   b. Discuss methods of on-line and off-line biomass estimation and their measurement of important phyico chemical and biochemical parameters. **(10 Marks)**

Module-2

3. a. Compare closed-loop and open-loop control systems with a block diagram and an example. **(10 Marks)**
   b. Explain transfer function and derive the transfer function for mercury thermometer for first order systems. **(10 Marks)**

OR

4. a. Explain and derive the sinusoidal input of the first order system. **(10 Marks)**
   b. Derive the transfer function for non interacting system and explain. **(10 Marks)**

Module-3

5. a. With a neat outline diagram, derive transfer function second order system of damped vibrator. **(10 Marks)**
   b. The overall transfer function of the control systems given as
   $$G(s) = \frac{16}{1.5s^2 + 2.45 + 6}.$$
   A unit step change of magnitude 6 introduction in to the system. Determine: i) Overshoot ii) Decay ratio iii) Period of oscillation iv) Rise time. **(10 Marks)**

OR

6. a. With a neat outline diagram, derive transfer function of second order system of U tube manometer. **(10 Marks)**
   b. Discuss transportation lag of second order systems. **(10 Marks)**

Module-4

7. a. Explain and derive the transfer function of P-I controller and P-D controller. **(10 Marks)**
   b. With neat outline diagram, explain the function of pneumatic control valve. **(10 Marks)**

OR

8 a. With a neat block diagram, explain and derive the transfer function servo problem in (negative feedback) controllers. **(10 Marks)**

   b. Write a note on :   i) Actuators   ii) Positioners **(10 Marks)**

Module-5

9 Explain in detail the root locus procedure to find out transfer function of the control systems. **(20 Marks)**

OR

10 Discuss the stability control system represented by the characteristics equations :
$s^6 + 2s^5 + 8s^4 + 12s^3 + 20s^2 + 16s + 16 = 0$. **(20 Marks)**

* * * * *