

CBCS SCHEME

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15BT62

Sixth Semester B.E. Degree Examination, June/July 2019 Bioprocess Control and Automation

Time: 3 hrs.

Max. Marks: 80

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

Module-1

- 1 a. With neat diagram, explain the principle and working of any two temperature measuring instrument. (10 Marks)
- b. Write a descriptive note about orifice meter. (06 Marks)

OR

- 2 a. Explain in detail the state and parameter estimation techniques. (08 Marks)
- b. Write short notes on, Online Sensors used for biomass estimation. (08 Marks)

Module-2

- 3 a. Derive the transfer function for liquid level in tank with respect to output. (08 Marks)
- b. Derive the transfer function for two tank non interacting system. (08 Marks)

OR

- 4 a. A thermometer having at time constant of 0.1 minute is at a steady state temperature at 90°C . At time $t = 0$, it is placed in a temperature bath of 100°C . Determine the time needed to read 98°C . (04 Marks)
- b. Derive the transform of Sine and Cos function. (04 Marks)
- c. Derive the transfer function for mercury in glass thermometer and explain its assumptions. (08 Marks)

Module-3

- 5 a. Derive a Step response equation for second order system. (08 Marks)
- b. Derive the transfer of Spring damper. (08 Marks)

OR

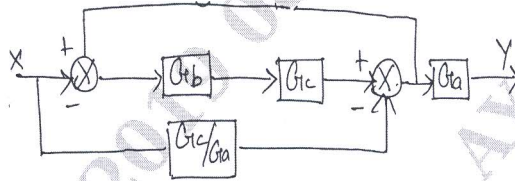
- 6 a. Explain the following terms used to describe an under damped system with the graph :
i) Overshoot ii) Decay ratio iii) Response time iv) Rise time
v) Period of oscillation vi) Natural period of oscillation. (14 Marks)
- b. Define Transportation lag. (02 Marks)

Module-4

- 7 a. Derive the transfer function for servo problem with neat block diagram. (08 Marks)
- b. Explain with equations the principle of PI and PID controllers and derive their transfer function. (08 Marks)

OR

- 8 a. Write short note on Final control element and its types. (08 Marks)
 b. Determine the transfer function for the block diagram given below : (08 Marks)



Module-5

- 9 a. For the Control system described by the following characteristic equation, check the number of roots having positive real parts
 $S^4 + 3S^3 + 5S^2 + 4S + 2 = 0$. (08 Marks)
 b. Draw a Bode diagram for a first order system. (08 Marks)

OR

- 10 a. Explain the merits and demerits of Routh test. (06 Marks)
 b. For the given Open loop transfer functions find out the range of K for which the system is stable. What will be the frequency of sustained oscillation? (10 Marks)

$$G(s) = \frac{K}{(s+1)(50s^2 + 12s + 0.5)}$$

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