CBCS SCHEME

USN | | | | | | | | | | 15BT62

Sixth Semester B.E. Degree Examination, Dec.2018/Jan.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.   What are static and dynamic characteristics the instruments?   **(08 Marks)**
    b.   With neat sketch explain the construction and working electric resistance thermometer (any one).   **(08 Marks)**

OR

2   a.   List out the methods used for estimation of physical, chemical and biological parameters.   **(06 Marks)**
    b.   Explain various method used for online data estimation.   **(06 Marks)**
    c.   Write a note on flow injection analysis.   **(04 Marks)**

Module-2

3   a.   Derive transfer function of liquid filled thermometer starting with all assumptions.   **(08 Marks)**
    b.   A thermometer having first order dynamics with 6 seconds is placed in a temperature bath at 30°C. After thermometer reaches steady state it is suddenly placed in a hot fluid at 60°C. Calculate the temperature indicated by thermometer at t = 3 sec, t = 6 sec and t = 10 sec.   **(08 Marks)**

OR

4   a.   Derive equation for step response of non-interacting multicapacity control system $\tau = \tau_1 = \tau_2$.   **(09 Marks)**
    b.   A tank having cross sectional area of $0.5m^2$ the steady state flow rate of liquid is $0.6m^3$/min. The flow rate is subjected to the impulse change of magnitude $0.05 \ m^3$/min. The time constant for the tank is 1 min. Determine the outlet flow rate at t = 0.5min, t = 1 min and t = 1.5 min.   **(07 Marks)**

Module-3

5   a.   Derive the transfer function for U-tube manometer starting with all assumptions.   **(08 Marks)**
    b.   A control system having transfer function is expressed as $G(s) = \dfrac{5}{1.8s^2 + 3s + 5}$. The control system is subjected to a step change of magnitudes 5. Calculate:
    i)   The value of y(t) at t = 0.5 min, t = 1 min t = 1.5 min.
    ii)   Overshoot
    iii) Radian frequency.   **(08 Marks)**

OR

6   a.   Explain the characteristics of under damped system.   **(10 Marks)**
    b.   Write a note on transportation lag.   **(06 Marks)**

Module-4

7 a. With neat sketch, explain the working of final control element. **(08 Marks)**
   b. Explain the different types of plugs used in pneumatic value, explain their characteristics with flow and position of the valve. **(08 Marks)**

OR

8 a. Derive equation for PID controller. **(05 Marks)**
   b. What is servo and regulatory problem derive the equation for the same. **(11 Marks)**

Module-5

9 a. What the stability criteria for linear system? **(04 Marks)**
   b. A control system is represented by means of a block diagram shown in figure.
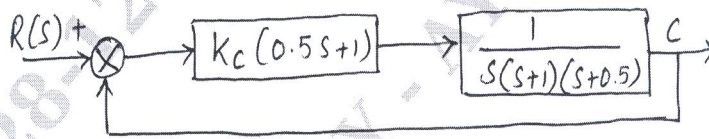

Fig.Q.9(b)

Determine the value of K_c gain of controller just causes instability. Use Routh criterion. Also determine the location of the pair of rots lie on the imaginary axis for control system. **(08 Marks)**

   c. Explain frequency response of I-order system. **(04 Marks)**

OR

10 a. Explain the stepwise procedure for root locus diagram. **(12 Marks)**
   b. Write a note on Nyquist stability criteria. **(04 Marks)**

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