B.E. Instrumentation Engineering (Model Curriculum) Semester-VII

IN702M - Process Control

P. Pages : 2 **GUG/W/24/14257**

Time : Three Hours * 5 7 4 2 * Max. Marks : 80

Notes : 1. All questions carry marks as indicated.
2. Due credit will be given to neatness and adequate dimensions.
3. Assume suitable data wherever necessary.

1. a) Explain cascade control strategy with block diagram and proper example. **8**

b) Describe process control mechanism in detail with neat and labelled diagram. **8**

OR

2. a) Compare between regulatory and servo control mechanism. **8**

b) Write a note on Adaptive control mechanism. Also, explain. **8**

i) Gain scheduling.

ii) Model Reference Adaptive Modelling.

iii) Self – Tunning Regulation.

3. a) Compare between white box model and black box model. **8**

b) Explain the principle of formation of mathematical modelling along with suitable example. **8**

OR

4. a) Derive mathematical model of non-isothermal CSTR with variable hold-up. **8**

b) Derive mathematical model of CSTR for exothermic reaction. **8**

a) Total mass balance.

b) Component of balance of Chemical ‘A’.

c) Total energy balance of system.

5. a) Discuss 1st order system with respect to its capacity for **8**
a) Mass storage b) Energy Storage.

b) Write a note on non-interacting capacities. Also derive mathematical model for two interacting capacities in series. **8**

OR

6. a) Explain dynamic response of 1st order system of unit step input. **8**

b) Obtain mathematical model of U-tube manometer. **8**

7. a) Explain interaction of control loops for two control loops for two controlled outputs and two manipulated variables. **8**

b) Consider 2*2 two input two outputs MIMO process as below: **8**

$$Gp(s) = \begin{vmatrix} \frac{0.3}{10s+1} \times \frac{1}{10s+1} \\ \frac{2}{10s+1} \quad \frac{0.4}{10s+1} \end{vmatrix}$$

Find RGA and recommended possible pairings.

OR

8. a) Explain "Bristol's relative gain array (RGA) Method for selection of pairs Input and output variables to minimize interaction loops. **8**

b) Explain "Interaction of Control Loops for Stirred Tank Heater". **8**

9. a) Discuss the role of artificial rural network in process control application, Illustrate with suitable example. **8**

b) Discuss stepwise design procedure to fuzzy logic-based controller given its applications. **8**

OR

10. a) Define fuzzy logic. Discuss the potential advantages of fuzzy logic-based system over classical approach. **8**

b) How fuzzy sets are represented mathematically? Illustrate with example. **8**

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