

B.E. Instrumentation Engineering (Model Curriculum) Semester - VII
IN702M - Process Control

P. Pages : 2

Time : Three Hours



GUG/S/23/14257

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) What do you mean by Process? Describe in detail about the process characteristics. **8**
b) Compare between regulatory and servo control mechanism. **8**

OR

2. a) With the help of suitable diagram, explain in details the process control mechanism. **8**
b) Describe in detail the design aspects of process control systems. **8**
3. a) Explain the principles of formulation of mathematical modeling along with suitable example. **8**
b) Derive the mathematical model of non-isothermal CSTR with variable holdup. **8**

OR

4. a) Derive mathematical model of Armature controlled DC motor. **8**
b) Compare between white box model & black box model. **8**
5. a) Discuss the mathematical model of "Surge tank with non-linear value at outlet side with relation $F_{out} = \alpha\sqrt{h}$ ". **8**
b) Discuss "Unit step response of Ist order system". **8**

OR

6. a) Explain "Response to step input of IInd order system". **8**
b) Obtain the mathematical model of "U-tube manometer". **8**
7. a) Explain "Interaction of control loops for 2-controlled o/p's and 2-manipulated inputs". **8**
b) Consider a process following Input-output relationships: **8**

$$\bar{y}_1 = \frac{1}{s+1} \cdot \bar{m}_1 + \frac{1}{0.1s+1} \cdot \bar{m}_2$$

$$\bar{y}_2 = \frac{-0.2}{0.5s+1} \cdot \bar{m}_1 + \frac{0.8}{s+1} \bar{m}_2$$

Select the loops using Relative Gain Array (RGA).

OR

8. a) Explain “Interaction of control loops in a stirred tank Heater”. **8**
- b) Consider a wood-Berry binary distillation column as below: **8**

$$\begin{bmatrix} x_D \\ x_B \end{bmatrix} = \begin{bmatrix} \frac{12.8e^{-s}}{16.7s+1} & \frac{-18.9e^{-3s}}{21s+1} \\ \frac{6.6e^{-7s}}{10.9s+1} & \frac{-19.4e^{-3s}}{14.4s+1} \end{bmatrix} \begin{bmatrix} R \\ S \end{bmatrix}$$

Find the RGA & Recommend the possible pairings.

9. a) Discuss the role of neural Network in process control applications. Illustrate with suitable example. **8**
- b) Discuss the role of fuzzy logic in process control applications. Illustrate with suitable example. **8**

OR

10. a) Discuss design procedure of neural network based controller for process control applications. **8**
- b) Discuss the step wise design procedure of fuzzy logic based controller for process control applications. **8**
