

B.E. Instrumentation Engineering (MODEL CURRICULUM) Semester-VII  
**IN702M - Process Control**

P. Pages : 2

Time : Three Hours



**GUG/W/22/14257**

Max. Marks : 80

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- 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) Describe in details the design aspects of process control systems. 8  
b) What is process control? Describe in detail the characteristics of typical process. 8

**OR**

2. a) Give the classification of process control strategies. Explain any one in detail. 8  
b) Write a short note on: 8
  - i) Regulatory control system
  - ii) Serve control system
3. a) Derive the mathematical model of non isothermal CSTR with variable hold-up. 8  
b) Explain the principles of formulation of mathematical modeling with suitable example. 8

**OR**

4. a) Derive the mathematical model of liquid level process. 8  
b) Write a short note on: 8
  - i) White box model
  - ii) Black box model
5. a) Discuss unit step response of first order system. 8  
b) Obtain the mathematical model of U-tube manometer. 8

**OR**

6. a) Discuss the step input response to second order dynamical system. 8  
b) Obtain the mathematical model of surge tank with linear valve. 8
7. a) Discuss the interaction of control loops for two controlled outputs and two manipulated inputs. 8

- b) Consider a process with following input – output relationships. 8

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

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

Select the loops using relative gain array (RGA).

**OR**

8. a) 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 RGA & recommend the possible pairings.

- b) Explain interaction of control loops in a stirred tank reactor. 8
9. a) Discuss the role of neural network in process control applications illustrate with suitable example. 8
- b) Discuss the stepwise design procedure of fuzzy logic based controller for process control applications. 8

**OR**

10. a) Discuss the stepwise design procedure of neural network based controller for process control applications. 8
- b) Give the comparison between PID, fuzzy logic and neural network controller with respect to following points. 8
1. Requirement of process knowledge
  2. Tuning parameters
  3. Applicable to linear & nonlinear systems
  4. Self-learning and adaptive
  5. Applications

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