Con. 5372-09.

INST

SP-9057

(3 Hours) 15/12/09 [Total Marks 100]

N. B.: (1) Question No. 1 is **compulsory**.
(2) Attempt any **four** out of remaining **six** questions.
(3) Assume any **suitable** data wherever **required** but justify the **same**.
(4) Illustrate the answers with sketches wherever **required**.
(5) **All** questions carry **equal** marks.

I. Attempt *any 4* questions:
   i. Discuss the effect of dead time on control.
   ii. Name the modeling methods available with their constraints.
   iii. Discuss various control schemes available for the batch and the continuous processes.
   iv. Explain the terms w. r. t. batch process – Recipe / Grade / Unit / operation / Procedure.
   v. Explain the inverse response or non minimum phase response and its effect in dynamic systems.
   vi. Discuss the responses of Second order systems with one example.

2. a) Develop a mathematical model for two tank interacting capacities.
   b) Discuss the criterion to decide on the degrees of freedom. Explain the same with one example.

3. a) Explain the following with respect to Inferential control:
   i. The concept
   ii. The need and
   iii. Steps involved in designing estimator
   b) Discuss the control schemes recommended for the interacting and non interacting processes.

4. a) Comment on the selection of control schemes for continuous and batch processes with justification.
   b) Suggest the control schemes for jacketed Batch reactor to control the temperature in the reactor. The steam is used for heating the material in the reactor.

5. a) Explain ratio and cascade control schemes with examples.
   b) Develop electronic PID controller and explain the each term in detail.

6. a) Discuss the architecture of PLC.
   b) For the following storage tank application:
   i) Product A is stored in Tank 1.
   ii) Product B is stored in Tank 2.
   Develop ladder to control the level, pressure and temperature in both the tanks. Raise the alarms. The redundancy is provided to pumps allocated to each tank to pump the material out for the various purpose. The pumps should stop when material in the tanks reaches to LOW level and pressure drops to LOW level.

7. a) Explain any one tuning method used widely in process industry.
   b) Discuss any one advanced controller with its basic principle and need.