

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VII(NEW) • EXAMINATION – WINTER 2016****Subject Code:2171710****Date:25/11/2016****Subject Name: Process Dynamics and Control****Time:10.30 AM to 1.00 PM****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks

- Q.1** (a) Explain different methods of controlling pressure in a distillation column. **07**
(b) Compare different control strategies for heat exchangers with suitable diagrams. **07**

- Q.2** (a) Discuss control of overhead and bottom composition control for a distillation column. **07**
(b) Explain countercurrent type exchangers with necessary dynamic equations. **07**

OR

- (b) A mercury-in-steel thermometer sometimes shows an inverse response. The reading drops momentarily when the bulb is immersed in hot water, because the shell expands more rapidly than the mercury. How complex a model is needed to explain this behavior? Can inverse response be obtained if the wall and internal capacities are lumped? **07**

- Q.3** (a) Compare batch, continuous and packed-bed reactors. Also discuss stability issues associated with each in brief. **07**
(b) Explain single and two element control strategies for boiler. Discuss limitations of each. **07**

OR

- Q.3** (a) Explain three element control strategy and its limitations for boiler. Discuss advantages of it over single and two element control strategies. **07**
(b) Compare black, white and gray box models for process control problems with suitable examples. **07**

- Q.4** (a) Discuss the need of control scheme development for Waste-Water Treatment plant. **07**
(b) Explain the unit operations used in food and pharmaceutical industries with suitable process flow diagram. **07**

OR

- Q.4** (a) Gases A and B are fed continuously to a tank with a volume 20 ft^3 . The normal tank conditions are 20 psia and 70 Degree Fahrenheit, and the normal flow rates are $F_A=30$ and $F_B=20$ cfm measured at tank conditions if the flow of B is suddenly increased to 22 cfm, when does the concentration of B reach 95 percent of the new steady-state value? Also explain the response of two element interacting system. **07**
(b) Discuss the importance of system identification for petrochemical and fertilizer industries. **07**

- Q.5 (a)** Explain different factors which are governing the reaction of chemical reactors. **07**
(b) Explain the unit operations of paper industry with suitable process flow diagram. **07**

OR

- Q.5 (a)** What is frequency response for distillation column? Explain importance of it with necessary equations. **07**
(b) What are shrinking and swelling effect in boiler? Explain dynamic compensation of it. **07**

