

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-V (NEW) EXAMINATION – WINTER 2021****Subject Code:2151705****Date:28/12/2021****Subject Name:Process Control Systems****Time:02:30 PM TO 05:00 PM****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

MARKS

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|------------|---|-----------|
| Q.1 | (a) Write seven process control objectives and explain any one in detail. | 03 |
| | (b) Give FOPDT model of system, Show how to derive the parameters of FOPDT model from Process Reaction Curve. | 04 |
| | (c) Analyze the closed loop response of first order system with proportional control to unit step change in set point and unit step change in process load. | 07 |
| Q.2 | (a) What is self regulation? Give an example of self regulating process. | 03 |
| | (b) Briefly discuss override control scheme with associated diagram. | 04 |
| | (c) Draw the block diagram of cascade control scheme and Explain in Detail with suitable example. What are the limitations of cascade control strategy ? | 07 |
| OR | | |
| | (c) Draw the basic block diagram of feed forward control and Explain in Detail with heat exchanger, suitable example .Write the difference between feedback and feed forward control scheme. | 07 |
| Q.3 | (a) What are the performance criterions to design a control system ? | 03 |
| | (b) Explain shrinking and swelling phenomena in boiler drum and show three element control of boiler drum level. | 04 |
| | (c) What is degree of freedom ? Explain it in the context of CSTR with suitable equations and diagram. | 07 |
| OR | | |
| Q.3 | (a) Discuss the Bump less transfer Phenomenon, with suitable example. | 03 |
| | (b) What is integral windup ? Discuss with example. | 04 |
| | (c) Explain two position controller with suitable waveform. Show the effect of neutral zone on controller output. | 07 |
| Q.4 | (a) Explain Multi-position controller function with error Vs. controller output relation. | 03 |
| | (b) What causes inverse response ? Explain with mathematical arguments and associated diagrams. | 04 |
| | (c) Give out the guidelines for digital implementation of a PID controller in detail. Describe the steps/formulae associated with the same too. | 07 |
| OR | | |
| Q.4 | (a) What is offset in case of proportional control action ? How offset can be eliminated? | 03 |

- (b) What is adaptive control ? Explain gain scheduling technique in the context of adaptive control with suitable diagram and mathematical calculation. **04**
- (c) Discuss closed loop Zeigler Nichols tuning method of PID controller, with suitable diagram/calculation. **07**
- Q.5** (a) Explain selective control scheme, Briefly with suitable example. **03**
- (b) What do you mean by the term 'Dead Time' ? What is its effect on the stability of system ? **04**
- (c) With suitable diagram explain the control scheme for maintaining proper air to fuel ratio for drum boilers. **07**

OR

- Q.5** (a) Briefly explain, the split range control scheme, with suitable example. **03**
- (b) Discuss with the examples, the interacting and non-interacting processes and explain in brief. **04**
- (c) How to convert nonlinear term to linear and why ? Explain the complete process and methods with suitable example. **07**
