

GUJARAT TECHNOLOGICAL UNIVERSITY**BE- VIth SEMESTER-EXAMINATION – MAY- 2012****Subject code: 161702****Date: 11/05/2012****Subject Name: Process Control****Time: 10:30 am – 01:00 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) What are the different control modes? Specify the situation in which each is preferred. **07**
- (b) Explain Ziegler-Nichols open loop method **07**
- Q.2** (a) A 5-m diameter cylindrical tank is emptied by a constant outflow of 1 m³/min. A two position controller is used to open and close a fill valve with an open flow of 2 m³/min. for level control, the neutral zone is 1 m and the set point is 12m **07**
- (1) Calculate the cycling period
- (2) Plot the level versus time
- (b) Explain cascade control with algorithm **07**
- OR**
- (b) Given a feedback control system such as the three tank mixing process, determine the effect of the following equipment changes on the tuning constants. **07**
- (1) Installing a faster responding control valve
- (2) Installing a control valve with a larger maximum flow
- (3) Installing a faster responding sensor
- Q.3** (a) Where would you use a split range control? Mention some field of application of such a control **07**
- (b) Explain the selective and override control **07**
- OR**
- Q.3** (a) Design a mathematical model of ON-OFF Room heating **07**
- (b) Explain Feed forward control and its algorithm **07**
- Q.4** (a) Describe the features of a process for which on/off control would be appropriate. The description should include process dynamics disturbance frequency and magnitude and control objectives **07**
- (b) Explain modeling procedure with an example **07**
- OR**
- Q.4** (a) Explain the bode method for the analysis of the stability of control systems **07**
- (b) Describe how you would calculate the PID algorithm in a digital computer. Prepare a flow chart of the calculations. **07**
- Q.5** (a) Write the factors of control performance measures for set point input changes **07**
- (b) For a Proportional controller, the controlled variable is a process temperature with a range of 50⁰ to 130⁰c and a set point of 73.5⁰. Under nominal conditions the set point is maintained with an output of 50%. Find the percentage controller output with the proportional gain of 2 if the temperature is (1) 61⁰ c (2) 122⁰ c (3) a ramping temperature of (82+ 5t)⁰ c. **07**

OR

Q.5 (a) Explain the Ratio control in details

07

(b) Define:

07

- (1) Offset
- (2) Rise time
- (3) Transient Response
- (4) Error
- (5) Control lag
- (6) Dead time
- (7) Control Parameter range
