Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI- EXAMINATION – SUMMER 2016

Subject Code:161702 **Date:21/05/2016**

Subject Name:Process Control

Time: 10:30 AM to 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)** Explain the following terms: (any two) **07**

a. Degree of freedom
b. Overall Material Balance
c. Component Material Balance

(b) Error curve rises linearly to 1% in 0.5 min and remains fixed at 1%. Proportional gain K_p=2, Derivative gain K_d=1 min and integral gain K_i=0.5 min^{-1}. Controller bias is 0%. Find the controller output at time t=0, 0.5 min and 1.0 min, when controller is (i) PD (ii) PI. **07**

Q.2 **(a)** Explain the on off control of room heating process with energy balance equation. **07**

(b) Obtain the mathematical model of level tank process with necessary equation and neat diagram. Outlet flow is $F_1=kL^{0.5}$. Where k is constant, L is level. **07**

OR

(b) Discuss Linearization in detail. **07**

Q.3 **(a)** Explain the Zeigler Nicholas tuning method (close loop) in detail. **07**

(b) What do you mean by offset in case of proportional controller mode? How offset can be eliminated? How PI control is better than only P controller? **07**

OR

Q.3 **(a)** Draw and Explain the Parallel system structure. Derive its Transfer function. Draw the response of a sample parallel system to a unit step input. **07**

(b) Derive the transfer function of two non interacting series tanks. And Draw the system response to a unit step input. **07**

Q.4 **(a)** Explain Reverse and Direct action of a controller showing examples. **07**

(b) Consider a transfer function: Consider a transfer function. Derive an approximate first-order-plus-time-delay model, using Taylor series expansion. **07**

$$G(s) = \frac{K(-0.1s+1)}{(5s+1)(3s+1)(0.5s+1)}.$$

OR

Q.4 **(a)** Write about the benefits of control and control objectives. **07**

(b) Brief about process reaction curve and obtain the first order plus dead time model for plant. **07**

Q.5 **(a)** Explain the feed forward control strategy with suitable example. **07**

(b) Explain the split range control. **07**

OR

Q.5 **(a)** Write notes on ratio control strategy. **07**

(b) Write notes on cascade control strategy with suitable example. **07**

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