

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-V • EXAMINATION – SUMMER 2013****Subject Code: 150504****Date: 20-05-2013****Subject Name: Instrumentation and 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) Derive transfer function for a system mercury-in-glass thermometer. What is the significance of time constant? **07**
- (b) A thermometer with time constant 7 sec showing a steady temperature of 30 °C is suddenly immersed in heated oil bath at 150 °C. Find **07**
- (i) Time required for temperature reading of 100 °C.
- (ii) Time required for the 80 % response.

- Q.2** (a) Derive overall transfer function for two tanks connected in series Non-interacting system. **07**
- (b) Derive the equation of unit step response for critically damped second order system. **07**

OR

- (b) Differentiate between positive feedback and negative feedback system. **07**

- Q.3** (a) Explain any one PI diagram for an important chemical equipment used in industries. **07**
- (b) A PI controller is used to control the pressure in the tank which varies from 40 psi to 140 psi. Desired pressure is 90 psi. ? Controller output is to change by 100% upon 40 psi pressure deviation. Reset rate is 1/5 repeats per minute and controller output at zero error is 50 %. Calculate the controller output at the end of 2 minutes, when pressure in the tank reaches 80 psi. **07**

OR

- Q.3** (a) Why P mode controller creates offset? How can it be overcome? **07**
- (b) What do you understand by stability of a control system? Briefly explain Nyquist stability criteria. **07**

- Q.4** (a) Describe various fluid density measurement methods? **07**
- (b) Describe various viscosity measurement methods? **07**

OR

- Q.4** (a) What is thermal well? Why is it used? How thermal well affect the dynamic response of the thermometer? **07**
- (b) Describe the principle, construction and working of thermocouple used for temperature measurement. **07**

- Q.5** (a) Explain the working of any one type of pyrometer. **07**
- (b) How is the gauge pressure and absolute pressure measured by liquid manometer? What are the advantages of the inclined manometer? **07**

OR

- Q.5** (a) List indirect level measurement methods and explain any one. **07**
- (b) State applications of composition analysis in chemical industries. **07**
