

GUJARAT TECHNOLOGICAL UNIVERSITY
B. E. - SEMESTER – VI • EXAMINATION – WINTER 2012

Subject code: 160404**Date: 05/01/2013****Subject Name: Instrumentation and Process****Time: 02.30 pm - 05.00 pm****Total Marks: 70****Instructions:**

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

Q.1 (a) Derive the transfer function of mercury thermometer. Determine the response equation of mercury thermometer for impulse forcing function. **07**

(b) Define and explain the following terms. **07**
 1) Time Constant 2) First order system 3) Forcing Functions

Q.2 (a) Define interacting and non-interacting system. Derive the transfer function for interacting systems. **07**

(b) Mention different examples of the first order systems and derive the expression for the transfer function for liquid level in a tank. **07**

OR

(b) Define second order systems. Determine the transfer function for U-tube manometer in which the pressure P is applied on one arm and second arm is open to the atmosphere. **07**

Q.3 (a) Write short notes on **07**
 (i) Bimetallic thermometer (ii) Bubbler system for liquid level measurement.

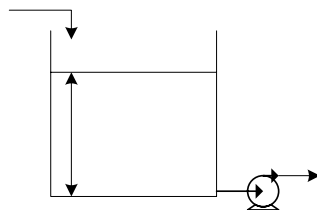
(b) What are static characteristic of an instrument? Define **07**
 Accuracy 2) Reproducibility 3) Sensitivity

OR

Q.3 (a) Define Servo problem and Regulator problem. A PD controller is used to control first order system with first order measuring element. Determine the expression for the offset for servo mechanism control system. **07**

(b) Describe the principle, construction and working of thermocouple used for temperature measurement. **07**

Q.4 (a) Derive the transfer function $H(s)/Q(s)$ for the following liquid-level system. **07**



(b) The open loop transfer function of a control system is given as **07**

$$G(s) = \frac{K_c(s+1)}{s(s+2)(s+3)}$$

Determine the stability of system and find the location of a pair of root of the

characteristic equation lie on the imaginary axis.

OR

- Q.4 (a)** The open loop transfer function of a control system is given as, **07**

$$G(s) = \frac{K_c}{s(s+1)(s+2)}$$

Sketch the root locus diagram of the system.

- Q.4 (b)** Describe the principle, construction and working of orifice flow meter. What are its advantages and limitations? **07**

- Q.5 (a)** Define amplitude ratio and phase angle. Plot the Bode diagram for the proportional Integral controller. **07**

- (b)** (1) Give merits and demerits of P, PI and PID controller. **03**

- (2) Explain Servo and Regulator control with suitable examples **04**

OR

- Q.5 (a)** Write short notes on Bellows pressure elements. **07**

- (b)** Describe the principle, construction and working of radiation pyrometer. **07**
