Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V EXAMINATION – WINTER 2015

Subject Code: 2151402 **Date:05/12/2015**

Subject Name: Food Process Instrumentation and Control

Time: 10:30am to 1:00pm **Total Marks: 70**

Instructions:

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

1Q **a** What is thermocouple? Explain the sensitivity of thermocouple. A platinum / rhodium have installed with an operating range up to 1400^0C with an EMF is 50.21 mV at this temperature. This thermocouple is exposed to a temperature of 920^0C. The cold junction temperature is estimated to be 35^0C. Calculate the sensitivity and EMF indicated of thermocouple. **07**

b What do you mean by specific gravity? What are the different scales to measurement of specific gravity? Discuss the principle of hydrometer both manually and LVDT type with diagram. **07**

2Q **a** Write a short note on Second order systems. Define sensitivity. The spring balance sensitivity at 25°C and 30°C is 17mm/kg and 32 mm/kg. What is the value of sensitivity drift/°C for a given spring balance? **07**

b (1)Describe in brief about ratio control loop **07**

(2) Write a short note on cascade control

OR

b Discuss the followings

1. Peltier effect
2. Main Scale
3. Auxiliary Scale
4. Contraction chamber
5. Expansion chamber
6. Partially immersed thermometer
7. Totally immersed thermometer

3Q **a** Answer the followings **07**

(1) The pneumatic signals of the instruments lies in the range of --- to ---- psi

(2) Define analog signals

(3) Explain Hysteresis with equation and figure

(4) If a temperature sensor works in the range of -60 to 100º C calculate span of the same

(5) Define Resolution

(6) If a reaction temperature in a reactor given is 210±2º C .what does ±2 indicates in reactor?

(7) Define death space

	b	Give the neat sketch of design of orifice plate. Discuss the construction and types of orifice plate with diagram.	**07**

OR

3Q	**a**	Define Laplace transform of function f(t). Find Laplace transform of f(t)= cos kt*u(t) , t>0, Where, u(t) is a unit step function	**07**
	b	Explain the system of two interacting tanks in detail with transfer function.	**07**
4Q	**a**	Explain the working principle of the followings with diagram. 1. High-wire pressure transducer 2. McLeod Gauge 3. Thermal conductivity gauge	**07**
	b	State the importance of pressure measurement in food industry. Write down the basis of categorization of pressure measurement devises. Discuss different pressure measuring methods.	**07**

OR

4Q	**a**	Discuss about the electrical resistance thermometer. Why platinum is used in PRT, also discuss its construction with diagram.	**07**
	b	Derive a standard equation for first order system by taking thermometer example. Describe in detail about feed forward control system with figure.	**07**
5Q	**a**	What do you understand by flow? Explain the classification of flow meter and derive the equation for head type flow meter.	**07**

	b	Describe the principle of turbine flow meter with detailed labelled diagram.	**07**

OR

5Q	**a**	Explain the principle of rotameter with diagram. Also discuss the advantages and limitations of that.	**07**
	b	List out the importance of temperature measurement in food industry. Why mercury is used in thermometer? Prove that; $$\frac{C}{5} = \frac{F-32}{9}$$	**07**