Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V • EXAMINATION – WINTER • 2014

Subject Code: 151402 **Date: 03-12-2014**

Subject Name: Food Process Instrumentation and 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) 1) Find inverse Laplace transform of f(s) **07**

$$F(s)=\frac{s^2+1}{s^2(s+2)}$$

Explain ramp input with a graph

(b) Define the term thermocouple. Discuss the see beck and peltier effect. List out the different types of thermocouple with its range and material of construction. **07**

Q.2 (a) **07**

1. _____ are semiconductors which generally have NTC of resistance.
2. Freezing and boiling point of mercury is _____ and _____.
3. Bimetallic thermometer is employed in the range of _____to _____.
4. If temperature of water is 300^0K, and then the temperature in Rankine scale is ___.
5. An enlargement of capillary bore between the auxiliary and main scale called ____.
6. Platinum has high accuracy _____ up to 500^0C and _____ up to 1200^0C.
7. RTC is made of _____ and _____.

(b) Write in brief about Bode diagram with neat sketch. **07**

OR

(b) Explain the system of two interacting tanks in detail with transfer function. **07**

Q.3 (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 with diagram of the working of Microwave absorption method, Radio frequency Impedance technique and DC Resistance technique for the measurement of moisture. **07**

OR

Q.3 (a) A tank is having 25 liter of water and suddenly we are adding 1 lit water in a tank for this system explain feedback control for this system **07**

(b) Explain the importance of specific gravity measurement in process control. Explain different types of instrument used to measure specific gravity. **07**

Q.4 (a) What do you understand by resistance strain gauge? Explain with diagram of balance and unbalance bridge. **07**

(b) Find equation of transfer function for mercury in glass thermometer. **07**

OR

Q.4 (a) Write a short note on : Analog and Digital signals **07**

(b) i. Find the resistance of wire at 0^0C and value of temperature coefficient at 0^0C, if the resistance of a wire is 70Ω at 30^0C and 90Ω at 95^0C. **07**

ii. The field resistance of a DC machine is 50Ω at 20^0C. The resistance increases to 55Ω at 50^0C. Find the temperature coefficient of the resistance material.

Q.5 **(a)** Draw the diagram of the followings; **07**

1. Knudson gauge
2. Target flow meter
3. Mercury in glass thermometer
4. LVDT type hydrometer

(b) a) Define the followings **07**

1. Process variables
2. Linearity
3. Precision
4. Hysteresis

b) What is equation of state and explain the same for heating in furnace.

OR

Q.5 **(a)** We have mercury thermometer graduated from -1 to 101^0C with a 0.1 divisions. We are measuring the temperature of a liquid in a beaker. Thermometer is immersed to 31^0C marks. Then the reading of the thermometer is 90.15. Assume average temperature of the liquid column is 25^0C. Calculate; **07**

1. How much error do you have for incorrect immersion of thermometer?
2. What is the actual temperature of the liquid is being measured?

(b) Give the working principle of McLeod gauge with diagram. A McLeod gauge has volume of bulb, capillary and tube down to its opening equal to $95cm^3$ and a capillary diameter of 1.5mm. Calculate the pressure indicated by a reading of 5cm. **07**

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