

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 Seebeck and Peltier effect. List out the different types of thermocouple with its range and material of construction. **07**

Q.2 (a) 1. _____ are semiconductors which generally have NTC of resistance. **07**

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°K , 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°C and _____ up to 1200°C .
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 $f(t) = \cos kt \cdot u(t)$, $t > 0$, 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°C and value of temperature coefficient at 0°C , if the resistance of a wire is 70Ω at 30°C and 90Ω at 95°C . **07**
- ii. The field resistance of a DC machine is 50Ω at 20°C . The resistance increases to 55Ω at 50°C . 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°C with a 0.1 divisions. We are **07**
measuring the temperature of a liquid in a beaker. Thermometer is immersed to 31°C
marks. Then the reading of the thermometer is 90.15 . Assume average temperature of
the liquid column is 25°C . Calculate;
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 **07**
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 .
