Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V • EXAMINATION – SUMMER 2013

Subject Code: 151402 **Date: 21-05-2013**

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)** Define Vena contracta, Discharge coefficient and Reynolds number. Starting from Bernoulliôs theorem obtain an expression for the volume flow rate of a one dimensional incompressible fluid flow through a horizontal pipe installed with an orifice meter. **07**

(b) Explain the role of moisture content in quality of food. Discuss the following techniques for the measurement of moisture; **07**

1. Microwave absorption method
2. Radio frequency Impedance technique
3. DC Resistance technique
4. Infrared technique

Q.2 **(a)** What is the importance of colour measurement in food industry? Explain the principles of Tristimulus flicker method with schematic diagram. Also provide the colour and wavelength correspondence. **07**

(b) Discuss the working of following: **07**

1. Hair hygrometer
2. Hook gauge method
3. Bubbler method

OR

(b) Write detailed notes on the following: **07**

1. Construction of orifice plate
2. Rotating concentric cylinder viscometer

Q.3 **(a)** We have mercury thermometer graduated from -3 to 101^0C with a 0.3 divisions. We are measuring the temperature of a liquid in a beaker. Thermometer is immersed to 33^0C marks. Then the reading of the thermometer is 92.15^0C. Assume average temperature of the liquid column is 27^0C. 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) What is resistance strain gauge? Differentiate between balanced and unbalanced bridge. Also prove that; **07**

$$I_G = \frac{-EF\varepsilon_1}{4(R_1 + R_G)}$$

OR

Q.3 **(a)** Discuss the working principle of Liquid in glass thermometer with diagram. Write down the advantages and disadvantages of thermometric fluids: Alcohol and Mercury. **07**

(b) What is thermocouple? Give advantages and limitations of thermocouple. Discuss the different arrangements that yield the same emf. **07**

Q.4 **(a)** What do you understand by transducers? Explain the working with the help of flow chart. State the factors to be kept in mind for selection of transducers. **07**

(b) Write down the different scales for the measurement of specific gravity. Discuss the working principle of rotating concentric cylindrical viscometer and efflux viscometer. **07**

OR

Q.4 **(a)** 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 $90cm^3$ and a capillary diameter of 1mm. Calculate the pressure indicated by a reading of 3cm. **07**

Q.4 **(b)** What are the different commercial scales to measure specific gravity? Discuss Bubbler method and LVDT type hydrometer with diagram. **07**

Q.5 **(a)** Discuss the importance of pressure measurement in food industry. Draw different elastic elements for pressure measurement. Also explain the working of U-tube manometer and Inclined manometer. **07**

(b) Write the application/uses of following instruments: **07**

1. Lactometer
2. Saccharometer
3. Knudsen gauge
4. Purge method
5. Bourdon gauge
6. Hygrometer
7. Pycnometer

OR

Q.5 **(a)** What is the difference between turbidity and colour from the measurement technique point of view? Explain the difference between basic turbidity meter and light scattering turbidity meter with diagram. **07**

(b) Explain the working principle of turbine flow meter with detailed diagram. **07**

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