

GUJARAT TECHNOLOGICAL UNIVERSITY**BE- Vth SEMESTER-EXAMINATION – MAY/JUNE - 2012****Subject code: 151402****Date: 04/06/2012****Subject Name: Food Process Instrumentation and Control****Time: 02:30 pm – 05:00 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)	How can you differentiate turbidity and colour as a instrumentation point of view? Describe different instruments used for the measurement of turbidity. Provide the list of wavelength for different colour.	07
	(b)	State the purpose of rotameter, its working principle with diagram. Also prove that; $Q_v = CEA_2 \sqrt{2g \frac{V_f}{A_f} \left(\frac{\rho_2 - \rho_1}{\rho_1} \right)}$	07
Q.2	(a)	What do you understand by electrical resistance thermometer? Explain the construction and working of PRT. A platinum resistance thermometer is used to measure temperature between 0 ⁰ and 200 ⁰ C. Given that the resistance at t ⁰ C as $R_t = R_0 (1 + \alpha t + \beta t^2)$ and R ₀ = 100Ω, R ₁₀₀ =138.50Ω and R ₂₀₀ =175.83Ω. Calculate the nonlinearity at 100 ⁰ C as a percent of full scale deflection.	07
	(b)	Explain in short how a thermistor differs from a thermocouple as a temperature sensor. State the advantages and limitations of thermocouple. What are the different arrangements of thermocouple in which emf will not change?	07
		OR	
	(b)	What is the role of humidity in the food processing environment? Discuss the working of hair hygrometer and also explain the working of different electrical types of humidity meters.	07
Q.3	(a)	Discuss the following direct and indirect liquid level measurement techniques; 1. Sight glass method 2. Float gauges 3. Purge method 4. Capacitance type 5. Ultrasonic liquid level gauges	07
	(b)	Write the specific application of following equipments in one line; 1. Microwave absorption method 2. Knudsen gauge 3. Efflux meter 4. Pitot tube 5. Saccharometer 6. Thermohydrometer 7. Aerometer	07
		OR	
Q.3	(a)	Fill in the blanks;	07

		1. Moisture content of fruits and vegetables can be measured in the microwave frequency band _____. 2. Colour measurements are concern only the visible range of spectrum _____ to _____. 3. Rotameter is always installed _____. 4. The minimum conductivity of the flowing fluid should be _____. 5. Units of vacuum measurement are _____. 6. The filament of Pirani gauge is made of _____. 7. Twaddle scale is the measurement of _____.	
	(b)	What is strain gauge? Discuss different types of strain gauges with diagram. A 100Ω strain gauge of gauge factor 2 is connected to the first arm of a Wheatstone bridge. Under no strain condition, all the arms have equal resistance. When the gauge is subjected to strain, the second arm resistance has to be changed to 100.56Ω to obtain a balance. Find the value of the strain.	07
Q.4	(a)	What are different temperature measurement methods? List out different types of thermometers based on physical properties. Explain the working of bimetallic thermometer.	07
	(b)	Discuss the following in brief; 1. Advantages of thermistor 2. Seebeck and Peltier effect 3. Materials of construction of T, K, R, B type thermocouple 4. Applications of transducers	07
		OR	
Q.4	(a)	What is Reynolds number? Discuss the working of target and magnetic flow meters with diagram.	07
	(b)	What are different types of scale to measure specific gravity measurement? Discuss the working of capillary viscometer and rotating cylinder viscometer.	07
Q.5	(a)	What is the importance of pressure measurement? Show Absolute, Atmosphere, Gauge and Vacuum pressure with diagram. Explain the working of high pressure measuring instrument.	07
	(b)	State the principle of; 1. Knudsen gauge 2. McLeod gauge	07
		OR	
Q.5	(a)	A gauge, made of a material having a resistance temperature coefficient of $12 \times 10^{-4}/^{\circ}\text{C}$, has a resistance of 120Ω and a gauge factor of 2. It is connected to a bridge having resistance of 120Ω each. The bridge is balanced at ambient temperature. If the temperature changes by 20°C, find; 1. Output voltage of the bridge if the input voltage is 10V 2. The equivalent strain represented by the change in temperature	07
	(b)	Draw the diagram only of the followings; 1. LVDT 2. Well manometer 3. Corrugated diaphragm and Bellows 4. Types of orifice plate 5. Liquid in glass thermometer	07
