

GUJARAT TECHNOLOGICAL UNIVERSITY
ME – SEMESTER II (NEW) – • EXAMINATION – SUMMER 2016

Subject Code: 2722105**Date: 24/05/2016****Subject Name: Experimental Techniques and Instrumentations in Thermal Engineering****Time: 10:30 am to 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)** The following readings are taken of a certain physical length with the help of a micrometer screw: 1.41, 1.45, 1.63, 1.54, 1.49, 1.51, 1.60, 1.55, 1.47, 1.65 mm. Assuming that only random errors are present, calculate the arithmetic mean, the average deviation, standard deviation, variance and the Probable error of the reading. **07**
- (b)** Describe the terms (1) Linearity (2) Repeatability (3) Calibration **07**
- Q.2 (a)** Suppose you have to measure pressure of the order of one micron, Sketch and explain the working of the system you would adopt. **07**
- (b)** What is the relationship between sensitivity and range? What is the disadvantage of very sensitive instruments? **07**
- OR**
- (b)** A resistor has a nominal stated value of $10 \Omega \pm 1$ percent. A voltage is impressed on the resistor, and the power dissipation is to be calculated in two different ways: (1) from $P = E^2/R$ and (2) from $P = EI$. In (1) only a voltage measurement will be made, while both current and voltage will be measured in (2). Calculate the uncertainty in the power determination in each case when the measured values of E and I are
 $E=100 \text{ V} \pm 1\%$ (for both cases)
 $I=10 \text{ A} \pm 1\%$ **07**
- Q.3 (a)** Differentiate between a bridge operated on the null principle and a bridge operated on the deflection principle. **07**
- (b)** Why is a reference temperature necessary when using thermocouples? Describe the most conventional methods for establishing reference temperature in thermocouple circuit. **07**
- OR**
- Q.3 (a)** Describe any one construction technique of RTD. Give name and explain the different methods for correcting lead resistance with electrical resistance thermometer. **07**
- (b)** Draw a Wheatstone bridge circuit and state the conditions which must exist for balance arrangement of resistors in it. **07**
- Q.4 (a)** Explain the essential differences between hydraulic and pneumatic controllers. Enumerate the advantages and limitations of each other. **07**
- (b)** Sketch and explain the working of pneumatic nozzle flapper used in pneumatic control system. **07**
- OR**
- Q.4 (a)** How data storage and data displayed occurs in data loggers? **07**
- (b)** Illustrate the proportional + Integral + derivative mode of control. State the merits of this multiple controller over the system that incorporates each mode individual. **07**
- Q.5 (a)** State the objectives of flow visualization. Explain some of the methods **07**

commonly adopted for flow visualization in low speed flows.

- (b) Explain with neat sketch of principle of operation of hot wire anemometer. **07**

OR

- Q.5** (a) Mention the optical methods of flow visualization and explain the operating principle. Sketch the schematics of one such method and explain its working. **07**

- (b) Draw and explain the gas chromatograph. State the name of different products of combustion measured with it. **07**
