Seat No.: _____ Enrolment No._____

# GUJARAT TECHNOLOGICAL UNIVERSITY

**ME - SEMESTER–II EXAMINATION – SUMMER 2015**

**Subject Code: 2722105** **Date: 26/05/2015**

**Subject Name: Experimental Techniques and Instrumentations in Thermal Engineering**

**Time: 02:30 PM to 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.**

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|---|---|---|---|
| **Q.1** | **(a)** | List the most general static characteristics of an instrument and define each term for the same. | **07** |
| | **(b)** | Evaluate the following statements:<br>1. Self heating cause a problem with RTDs while it is of lesser importance with thermistors.<br>2. Resistance of thermocouple wires not influence a temperature reading when a potentiometer is used. | **07** |
| **Q.2** | **(a)** | A resistor has a nominal stated value of 10 q ± 1%. A voltage is impressed on the resister, and the power dissipation is to be calculated in two different ways: 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<br>$E$ = 100 V ± 1 % (for both cases)<br>$I$ = 10 A ± 1 % | **07** |
| | **(b)** | How does an error differ from an uncertainty? What are the possible causes and types of experimental errors? | **07** |
| | | **OR** | |
| | **(b)** | Describe the most popular method for an uncertainty measurement in any experimental set up. Also explain how to measure uncertainties for product and additive functions. | **07** |
| **Q.3** | **(a)** | Distinguish among the shadowgraph, schlieren and interferometer flow visualization techniques. What basic flow variable is measured in each technique? | **07** |
| | **(b)** | Explain the flow visualization method which carries a very precise quantitative measurement of high frequency turbulence fluctuations. | **07** |
| | | **OR** | |
| **Q.3** | **(a)** | How does a gas chromatograph work? Explain with neat sketch and its applications. | **07** |
| | **(b)** | Draw a schematic of hot wire flow measurement circuit and explain the working of hot wire anemometer. | **07** |
| **Q.4** | **(a)** | Explain the general data acquisition system with neat line diagram. | **07** |
| | **(b)** | Write comparison between pneumatics and hydraulics controller system and also mention advantages of pneumatics and hydraulics. | **07** |
| | | **OR** | |
| **Q.4** | **(a)** | What is P, PI and PID controllers? Explain with neat sketch. Also mentioned it merits and demerits. | **07** |

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| | **(b)** | Draw a schematic of optical pyrometer and explain its working. | **07** |
| **Q.5** | **(a)** | Describe the basics of TAGUCHI method for design of experiments. | **07** |
| | **(b)** | Explain a device which is used for static calibration of pressure gauges. | **07** |

**OR**

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|---|---|---|---|
| **Q.5** | **(a)** | Write in brief about concentric cylinder method for measurement of thermal conductivity of liquid. | **07** |
| | **(b)** | Draw and explain in brief about three junctions and four junctions thermocouples in series. | **07** |

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