Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME - SEMESTER– II(New course) • EXAMINATION (Remedial) – WINTER- 2015

Subject Code: 2722105 **Date: 08/12/2015**

Subject Name: Experimental Techniques and Instrumentations in Thermal Engineering

Time: 2:30 pm to 5:00 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)**	What is meant by sensitivity; accuracy; precision? Why is instrument calibration necessary?	**07**
	(b)	1. How does an error differ from an uncertainty? 2. Define: Fixed error, random error and standard deviation. 3. In the normal error distribution, what does P(x) represent?	**07**
Q.2	**(a)**	Describe the ionization gage. How does it differ from the Pirani gage? What disadvantages does it have?	**07**
	(b)	Why is an uncertainty analysis important in the preliminary stages of experiment planning? How can an uncertainty analysis help to reduce overall experimental uncertainty?	**07**
		OR	
	(b)	The resistance of a certain size of copper wire is given as $R=R_0[1+Ŭ(Tī 20)]$, Where; R_0 =6q ±0.3 percent is the resistance at 20°C, Ŭ=0.004°C$^{ī 1}$ ±1 percent is the temperature coefficient of resistance, and the temperature of the wire is T = 30 ± 1°C. Calculate the resistance of the wire and its uncertainty.	**07**
Q.3	**(a)**	Draw and explain the working of bimetallic strip thermometer, also state its applications, advantages and disadvantages.	**07**
	(b)	What is thermistor? Describe the resistance characteristics of thermistors.	**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)	Why is a reference temperature necessary when using thermocouples? Describe the most conventional methods for establishing reference temperature in thermocouple circuit.	**07**
Q.4	**(a)**	What are the differences between active and passive filters? Write the function of lowpass active filter.	**07**
	(b)	Explain pneumatic relays with neat sketch.	**07**
		OR	
Q.4	**(a)**	How data storage and data displayed occurs in data loggers?	**07**
	(b)	What are PID controllers? State its applications, merits and demerits.	**07**
Q.5	**(a)**	Explain with neat diagram schlieren flow visualization technique. Upon what does the sensitivity of the schlieren depend?	**07**
	(b)	Name the three methods for combustion products measurement and explain Orsat apparatus with neat sketch.	**07**
		OR	

Q.5 **(a)** An interferometer is used for visualization of a free-convection boundary layer on a vertical flat plate in air. For this application the following data were collected: **07**

Plate temperature $T_w = 50°C$

Free-stream air temperature $T_Đ = 20°C$

ϭ = 0.000293

Depth of test section L = 50 cm

Wavelength of light source ϟ = 5460 Å

Reference density = 20 °C

Pressure = 1.0 atm

Calculate the number of fringes that will be viewed in the boundary layer.

(b) Explain the Principle of Laser Doppler Anemometer (LDA) with neat sketch. Also draw alternative schemes for accomplishing the scattering and measurement process in LDA. **07**

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