

**GUJARAT TECHNOLOGICAL UNIVERSITY****ME – SEMESTER –I-(New) EXAMINATION – WINTER 2019****Subject Code: 3710808****Date: 13/05/2019****Subject Name: Advanced Metrology and Experimental Techniques****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.

- Q.1** (a) Explain different types of experiments in brief with suitable examples. **07**  
 (b) Explain depth measurement using vision system. **07**

- Q.2** (a) Discuss general considerations in Data analysis. **07**  
 (b) Discuss various thermal aspects affecting accuracy. **07**

**OR**

- (b) A certain steel bar is measured with a device which has a known precision of  $\pm 0.5$  mm when a large number of measurements are taken. How many measurements are necessary to establish the mean length  $\bar{x}$  with a 5 percent level of significance such that  $\bar{x} = \bar{x} \pm 0.2$  mm ? For the given situation, obtain a new estimate for the number of measurements required using t-distribution. Use following table for t-distribution. **07**

$n$	25	26	27	28
$t_{95}$	2.064	2.060	2.056	2.048

- Q.3** (a) From the following data, obtain  $y$  as a linear function of  $x$  using the method of least squares: **07**

$y_i$	1.2	2.0	2.4	3.5	3.5	$\sum y_i = 12.6$
$x_i$	1	1.6	3.4	4.0	5.2	$\sum x_i = 15.2$

Also calculate the correlation coefficient for the least-square correlation.

- (b) Explain how LASER can be used for surface study. **07**

**OR**

- Q.3** (a) Explain the Chi-Square Test of Goodness of fit in detail. **07**  
 (b) Enlist techniques of image enhancements and discuss any one in detail. **07**

- Q.4** (a) Write short note on double exposure holographic interferometry. **07**  
 (b) Explain the displacement devices used in CMM. **07**

**OR**

- Q.4** (a) Explain different configurations of Coordinate Measuring Machine. **07**  
 (b) Explain experiment design protocols with suitable example. **07**

- Q.5** (a) Explain the use of probability distributions with suitable example. **07**  
 (b) Explain how LASER interferometer can be used for distance measurement. **07**

**OR**

- Q.5** (a) Enlist methods of improving accuracy and surface finish. Explain any one in detail. **07**  
 (b) Discuss Histogram Concavity technique used for machine vision systems. **07**

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