00183

BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (COMPUTER INTEGRATED MANUFACTURING)

Term-End Examination

December, 2012

BME-014 : METROLOGY AND INSTRUMENTATION

Time : 3 hours *Maximum Marks : 70*

Note : *Answer **any seven** questions. Use of scientific calculator is **permitted**. Assume missing data suitably if any.*

1. (a) In an experiment x is an independent variable and y depends upon it. The values are recorded as given below : 7

x :	0.225	2.075	3.005	3.950	4.850
y :	1	2.1	2.4	3.0	3.6

The relationship between x and y is proposed to be linear. Find equation to line and show on the graph.

(b) What are the errors of measurement ? 3

2. (a) What is the need to have standard units of quantities measured in engineering practice ? 4

(b) What are standard units of temperature, force, amount of substance. Mention the triple point of water, boiling point of water, force. All in standard units in CGS, FPS and SI. 6

3. A bar measuring (10 ± 0.2) mm is subjected to an axial load of $(5 \pm 2\%)$ T. Calculate the uncertainty in stress by 10
(a) common sense method and by
(b) analytical method

4. (a) Define fits and state classification. 2
(b) Define tolerance. Differentiate between unilateral and bilateral tolerance. 2
(c) For a particular application an H7 fit has been selected for the hole and K6 for the shaft. The tolerances quoted are $^{+25}_{0}$ and $^{+18}_{0.2}$ for the hole and shaft respectively. Find the upper and lower limits of diameters of shaft and hole. The basic size of fit is 50×10^{-3}m. What is the amount of interference ? 6

5. (a) Describe the tolerance of form and position and give their symbols. 4
(b) What are geometric forms and geometrical features ? How are the geometrical tolerances for parallelism, straightness, squareness, flatness and roundness indicated on drawing ? 6

6. (a) Sketch a Vernier Calipers and show how it measures the diameter of a wire. Compare it with micrometer. 6

(b) What is a strain gauge. What does it measure and what is gauge factor. What materials are used to make strain gauge ? 4

7. (a) What is a protractor ? Sketch a universal protractor and describe its functioning. 5

(b) What is a sine bar ? Explain how it measures angle. 5

8. (a) How do you obtain increased size of image from a projector ? 5

(b) What are engineering applications of projector ? 5

9. (a) What is the role of CMM in computer aided manufacturing ? 5

(b) Describe the advantages of CMM. 5

10. What are constructive and destructive interferences of two light waves ? Find the condition for maximum and minimum light intensity from two light waves E_0 (sinwt - ϕ_1) and E_0 sin(wt - ϕ_2) in terms of path difference Δ. ϕ_1 and ϕ_2 are the phases of light waves. 10