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BME-014

00977

BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (COMPUTER INTEGRATED MANUFACTURING)

Term-End Examination

June, 2013

BME-014 : METROLOGY AND INSTRUMENTATION

Time : 3 hours *Maximum Marks : 70*

Note : *(i)* *Solve **any seven** questions.*

(ii) *Use of scientific calculator is **allowed**.*

(iii) *Assume **missing** data suitably if **any**.*

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1. (a) Explain how do you arrive at definition of unit force ? Name the unit of force in cgs, FPS and SI units. 4

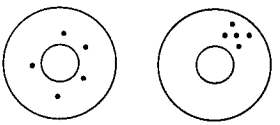
   (b) What is work ? What units it will have in three systems of units ? A mass of 2 kg is displaced through a distance 0.5 m, find the work done in J, Btu and erg. 6

2. (a) Following observations were recorded for the deflection of a spring under a given load which was removed after each observation. 7

   Deflection (mm) 0.541, 0.532, 0.548, 0.55, 0.538

   Find arithmatic mean, average deviation, standard deviation and geometric mean.

(b) Differentiate between accuracy and precision. Five shots are taken at a target. The distribution of shots is shown in (i) and (ii). Identify the accurate and precise. 3



(i) (ii)

3. (a) Describe clearance fit, interference fit and transition fit. Show them on a diagram. 5

(b) A clearance fit is required between a hole and a shaft. Hole is specified as $25^{+0.04}_{-0.00}$ and shaft as $25^{-0.02}_{-0.04}$ mm. Find the maximum and minimum sizes of hole and shaft. 5

4. (a) What is a gauge ? What are limit gauges ? Describe 3 gauges which are commonly used in production work. 5

(b) What are the functions of the following gauges ? 5

Form gauge, Taper gauge, Reference gauge, Filler gauge, Air gauge.

5. (a) Sketch a micrometer and describe how it functions. Compare it with Vernier Caliper. 6

(b) What is an LVDT ? What does it measure ? With the help of sketch explain how LVDT works. 4

6. (a) What is a comparator ? What is its function ? Sketch an electrical comparator and explain its functioning. 7

(b) A wire of resistance 212 Ω and length 200 mm is to be used as gauge. It is pulled by a force such that length increases to 201 mm. Find the gauge factor if resistance change is 2.26 Ω. 3

7. (a) What is a clinometer ? For what purpose it is used ? Sketch a clinometer. 5

(b) Describe autocollimator. On what principles does it work ? Describe an optical autocollimator. 5

8. Describe a tool maker's microscope. Show it on a sketch and describe its applications. 10

9. (a) What is a coordinate measuring machine ? Show bridge structure and gantry structure. 5

(b) Define two types of accuracy in respect of CMM.

Explain the meanings of following : 5

(i) Straightness of Axes

(ii) Squareness of Axes

(iii) Position accuracy

(iv) Axial length measuring accuracy

10. (a) Describe different light sources used in interferometry. 4

(b) Single wavelength light source has limited capacity. What alternative is suggested to improve measuring capacity ? Describe this interferometer. 6