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BME-014

B.Tech. MECHANICAL ENGINEERING (COMPUTER INTEGRATED MANUFACTURING)

00710

Term-End Examination

June, 2016

BME-014 : METROLOGY AND INSTRUMENTATION

Time : 3 hours *Maximum Marks : 70*

Note : *Answer any* ***ten*** *questions. All questions carry equal marks. Use of scientific calculator is permitted.*

1. Why are tolerances provided on dimensions of the components ? Explain each type of fit with suitable examples. 7

2. Sketch and describe the working principle and uses of any ***one*** of the following : 7

(a) Outside micrometer

(b) Inside micrometer

(c) Depth micrometer

3. What do you understand by the terms

(a) Precision,

(b) Reproducibility,

(c) Accuracy, and

(d) Error

as applied to methods of measurements ? Also explain the limitations of a micrometer. 7

4. Answer the following questions in numerical figures only : $7 \times 1 = 7$

(a) What is the accuracy of a Vernier caliper ?

(b) What is the accuracy of a micrometer ?

(c) What is the difference between 1 MSD and 1 VSD ?

(d) What is the pitch of a micrometer screw ?

(e) What is the value of each division of the thimble of a micrometer ?

(f) What is the number of divisions on the thimble of a micrometer ?

(g) In a Vernier caliper the main scale divisions are 1 mm apart. What should be the distance between Vernier divisions ?

5. (a) What is meant by the 'magnification' of a dial indicator ?

(b) Mention briefly the essentials of a good dial indicator. 4+3

6. In a hole and shaft combination of 25 mm nominal size H7,

hole limits are $\begin{matrix} +0{\cdot}021 \text{ mm} \\ +0{\cdot}000 \text{ mm} \end{matrix}$

and shaft limits are $\begin{matrix} -0{\cdot}040 \text{ mm} \\ -0{\cdot}073 \text{ mm} \end{matrix}$

State the values of

(a) maximum and minimum clearance obtainable,

(b) allowance,

(c) tolerance on the hole and the shaft.

(d) What type of fit is it ? *7*

7. Describe the principle and working of an autocollimator. *7*

8. Discuss the application of a tool-maker's microscope. *7*

9. (a) Name the instruments for measurement of dimensions that are based on optical principles. What are the principles of an optical projector ?

(b) Describe the advantages of projector. *4+3*

10. What is CMM ? What are the types of structure in which CMM is built ? *7*

11. (a) Explain the phenomenon of interference of light waves. Two monochromatic light waves emerge from two slits in the same vertical plane and reach at a point on the screen parallel to the plane of slit. Develop an expression for the path difference.

(b) Describe the light sources used in interferometry. *5+2*

12. What is a comparator ? Compare mechanical comparator with electrical comparator. *7*