Question Paper Code : 41382

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2024.

Fifth/Sixth/Seventh Semester

Mechanical Engineering

ME 3592 – METROLOGY AND MEASUREMENTS

(Common to Industrial Engineering/Industrial Engineering and
Management/Mechanical Engineering (Sandwich)/
Mechanical and Automation Engineering)

(Regulations 2021)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1.   Differentiate between sensitivity and accuracy?

2.   Define Calibration of a measuring instrument.

3.   List any four angular measuring instruments and rank based on accuracy.

4.   List any two opto-mechanical measurement devices with an application.

5.   What is the advantage of interchangeability?

6.   Draw an example schematic for tolerance callout as per standard.

7.   Infer the importance of geometric dimensioning and tolerancing.

8.   Write the advantage of 3D surface metrology?

9.   Why is laser preferred in engineering metrology?

10. List the benefits of using CMM for measurement?

PART B — (5 × 13 = 65 marks)

11. (a) Elaborate the different types of errors in measurement and remedies to minimize the errors.

Or

(b) What do you understand by uncertainty in measurement? Explain the types and estimation methods of uncertainty.

12. (a) Detail the setup and describe the functions of a pneumatic comparator with schematic representation of an application.

Or

(b) Explain the principle and construction of Angle Dekkor with a neat sketch and explain the measurement methods with the instrument for checking slope angle of a V-block and angle of a taper gauge.

13. (a) Justify the specification of tolerances in engineering design? Deliberate unilateral tolerance, bilateral tolerance and compound tolerance with schematics.

Or

(b) Design general type GO and NOGO gauges for a 40H7/d8 fit. The dimension 40 mm lies in the diameter range of 30 – 50 mm. Show the disposition of gauge tolerance zones relative to the work tolerance zones. Standard tolerance for IT 7 is 16i and IT 8 is 25i. Where 'I' is the standard tolerance unit. The upper deviation for 'd' of shaft is $-16 D^{0.44}$.

14. (a) What do you understand by GD & T? Discuss about the different types of form tolerances with schematics.

Or

(b) Describe the construction and measurement methodology of a stylus-type surface roughness measuring instrument with diagrams.

15. (a) Explain the construction, salient functional features and working of interferometer with schematics.

Or

(b) Explain the principle, basic functions and application of machine vision system with block diagram.

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16. (a) Differentiation between major, minor and effective diameter of a screw thread and explain the common measurement techniques of prominent screw thread parameters.

Or

(b) Develop the measurement method for inspection of straightness of a machine tool guide way using an Autocollimator. Show the tabulation to determine the error in straightness by choosing a reference line passing through the first and last points of the guide way.

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