Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 21302

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2023.

Fifth Semester

Mechanical Engineering

ME 3592 – METROLOGY AND MEASUREMENTS

(Common to : Industrial Engineering and Industrial Engineering and Management)

(Regulations 2021)

Time : Three hours | Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Summarize various elements of measurement.
2. Mention the main objectives of traceability.
3. List some of the parameters measured by Angle gauges.
4. Discuss the working principle of an autocollimator.
5. Define tolerance and mention its classification.
6. Draw the relationship between fundamental, upper and lower deviations in limits and fits.
7. What is the purpose of angle dekkor?
8. Explain the radial runout and axial runout.
9. Discuss the major applications of CMM.
10. Outline the elements of flexible inspection system.

PART B — (5 × 13 = 65 marks)

11. (a) Elaborate two broad categories of errors in measurement with suitable example.

Or

(b) Explain the working principle of a pneumatic back pressure gauge. Discuss the relevance of the characteristic curve in measurement.

12. (a) Discuss the procedure to measure the unknown angles with Sine Bar. Also, mention the use of Sine Blocks. Sine Plates, and Sine Tables.

Or

(b) Outline the constructional details of gear tooth caliper to measure the tooth thickness.

13. (a) A clearance fit has to be provided for a shaft and bearing assembly having a diameter of 40 mm. Tolerances on hole and shaft are 0.006 and 0.004 mm, respectively. The tolerances are disposed unilaterally. If an allowance of 0.002 mm is provided, find the limits of size for hole and shaft when (i) hole basis system and (ii) shaft basis system are used.

Or

(b) Summarize the various methods of tolerance specification on inspection Gauges with diagrams of disposition.

14. (a) Explain the working principle of stylus type surface roughness tester with a neat sketch.

Or

(b) Discuss various acceptance tests to be conducted for milling machine with required illustration.

15. (a) Elaborate the construction and working principle of Laser Interferometer used in metrology.

Or

(b) Analyze the five popular physical configurations used in machine vision system.

PART C — (1 × 15 = 15 marks)

16. (a) Design a general type of GO and NO GO gauge for components having 50 H7/d9 fit. The fundamental tolerance is calculated by the following equation :

$i = 0.453\sqrt[3]{D} + 0.001D$

The following data is given :

(i) Upper deviation of shaft = –16D0.44

(ii) 50 mm falls in the diameter step of 30–50 mm

(iii) IT7 = 16i

(iv) IT9 = 40i

(v) Wear allowance = 10% of gauge tolerance.

Or

(b) Enunciate the various stages involved in machine vision system with an example.

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