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Question Paper Code : 90860

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2022

Fifth Semester

Mechanical Engineering

ME 8501 – METROLOGY AND MEASUREMENTS

(Regulations 2017)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Distinguish between precision and accuracy.
2. Compare between Line and End standards with example.
3. State "Taylor's principle of gauge design".
4. A vernier scale consists of 25 divisions on 12 mm spacing and the main scale has 24 divisions on 12 mm. What is the least count?
5. Why is laser preferred in engineering metrology?
6. List any four possible causes of errors in CMM.
7. Figuratively represent the different elements of external screw thread.
8. Assume that the surface roughness profile is triangular as shown in fig. If the peak to valley height is $20\,\mu m$. Calculate the Centre Line Average (CLA) surface roughness Ra (in μm), if the datum line is at the middle of the triangles

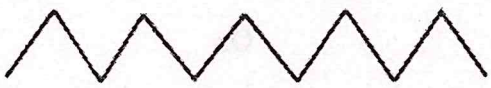

Fig. Surface Roughness Profile

9. Why measuring instruments are calibrated?
10. Give the applications of bimetallic strips.

PART B — (5 × 13 = 65 marks)

11. (a) (i) Give the structure of generalized measurement system with neat sketch (5)

(ii) Describe briefly about the following:

(1) Range of measurement (2)

(2) Repeatability (2)

(3) Traceability (2)

(4) Calibration (2)

Or

(b) A person weighs around 75 kg. He checks his weight using three different instruments. Following were the results obtained from the instruments:

Instrument 1	Instrument 2	Instrument 3
74	69	80
78	68	85
80	67	84
70	66	90
72	68	89
77	66	86

What types of errors are associated with these instruments and how it affects its accuracy and precision?

12. (a) (i) Explain the construction of Vernier Height Gauge with neat sketch (10)

(ii) List the applications of Vernier Height Gauge. (3)

Or

(b) (i) Write short note on interchangeability with an example. (3)

(ii) Describe with a sketch the principle behind the working of an autocollimator and mention its types. (10)

13. (a) Describe the working principle of a dual frequency AC laser interferometer with neat sketch.

Or

(b) Explain with a neat sketch the various stages of Machine Vision System and its application in metrology.

14. (a) Discuss the working principle of Parkinson gear tester with a neat sketch and its usage to check the composite errors in spur gear.

Or

(b) Discuss the working principle of Tomlinson Surface Meter for surface measurement with a neat sketch.

15. (a) (i) Enumerate the various devices to measure temperature. (3)

(ii) Explain the construction and working principle of thermocouple with neat sketch. (7)

(iii) Mention any two advantages and disadvantages of thermocouple. (3)

Or

(b) (i) Describe with neat sketch, the construction and working principle of the pitot tube. (8)

(ii) Describe the working principle of hydraulic dynamometer for measuring shaft power. (5)

PART C — (1 × 15 = 15 marks)

16. (a) (i) Write the significance of torque measurement. (5)

(ii) With neat sketch explain any two types of torque measurement techniques. (10)

Or

(b) List the various configurations of coordinate measuring machine. Explain the constructional features of any three configurations of CMM. Point out the applications of CMM in machine tool metrology.

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