Reg. No. : ☐☐☐☐☐☐☐☐☐☐☐☐☐

Question Paper Code : 20815

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2018.

Fourth/Fifth Semester

Mechanical Engineering

ME 6504 — METROLOGY AND MEASUREMENTS

(Common to : Materials Science and Engineering/Mechatronics Engineering)

(Regulations 2013)

(Also common to : PTME 6504 – Metrology and Measurements for B.E. (Part-Time)
Fourth Semester – Mechanical Engineering – Regulations – 2014)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the important elements of measurement?

2. Define sensitivity.

3. How do you find the least count of a micrometer?

4. What are the limitations of sine bar?

5. Name the types of laser.

6. How are CMM classified on the basis of configuration?

7. What is 'best wire size' in screw thread measurement?

8. Name any four elements of gear which are checked for accuracy.

9. What are torque meters?

10. State the various types of commercially available thermocouples.

PART B — (5 × 13 = 65 marks)

11. (a) (i) Describe the types of measurement.

   (ii) Differentiate between Precision and accuracy. (7 + 6)

Or

   (b) (i) What are the sources of errors? How are they classified?

   (ii) Write short notes on types of standards. (7 + 6)

12. (a) Discuss the construction, working principle, and applications of any one angular displacement measuring instrument. (13)

Or

   (b) Describe the working principle of Auto Collimeter with neat diagram. (13)

13. (a) (i) With the aid of sketches describe the laser telemetry system.

   (ii) Briefly explain principle of laser triangulation sensor. (7 + 6)

Or

   (b) (i) Discuss the construction and working of bridge type CMM.

   (ii) Enumerate the role of computers in Metrology. (7 + 6)

14. (a) (i) Illustrate with neat sketch the functioning of surface finish measurement system.

   (ii) Discuss the various elements of surface roughness. (7 + 6)

Or

   (b) Name the methods of measuring gear tooth thickness and explain any one in detail. (13)

15. (a) (i) Describe the force measurement using hydraulic load cell.

   (ii) Summarize the relative merits of Venturi, Flow Nozzle and Orifice. (7 + 6)

Or

   (b) (i) Sketch and describe the elementary thermocouple circuit.

   (ii) What is rotameter? Discuss its significance. (7 + 6)

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PART C — (1 × 15 = 15 marks)

16. (a) Design the general type GO and NO-GO gauge for the components having 20H7f8 fit. Given :

    (i)   'i' (micron) = $0.45 (D)^{1/3} + 0.001 D$

    (ii)   Upper deviation of 'f' shaft = $-5.5 D^{0.41}$

    (iii) 20 mm fall in the diameter step of 18 mm to 30 mm.

    (iv) IT7 = 16i

    (v)   IT8 = 25i

    (vi) Wear allowance 10% of gauge tolerance.   (15)

Or

    (b) Select a suitable autocollimator for checking angular indexing and for small linear displacements and illustrate its working with schematic diagram.   (15)

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