Reg. No. : ☐☐☐☐☐☐☐☐☐☐☐☐

Question Paper Code : 53311

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2019.

Fourth/Fifth Semester

Mechanical Engineering

ME 6504 — METROLOGY AND MEASUREMENTS

(Common to Materials Science and Engineering, Mechatronics Engineering)

(Regulation 2013)

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

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define Traceability.

2. What is difference between gauging and measurements?

3. Write short notes on Bevel Protractor.

4. Write short notes on interchangeability.

5. On what factor the accuracy of laser interferometer mainly depends?

6. List any three field applications of machine vision system.

7. Define "material ratio" with reference to surface finish measurement.

8. How is roundness measured in the Least squares circle method?

9. What are load cells?

10. Mention the principle involved in bimetallic strip.

PART B — (5 × 13 = 65 marks)

11. (a)   Classify standard methods of measurements in detail.   (13)

Or

(b)   What are the various possible sources of error in measurements ? Explain in detail.   (13)

12. (a) Discuss about various types of Limit Gauges.

Or

(b) Explain the construction and working of a Microptic autocollinator with a neat sketch.

13. (a) (i) With a neat diagram explain the working of AC laser interferometer. (8)

(ii) List the advantages of AC laser interferometer. (5)

Or

(b) (i) With neat sketch briefly explain the different types of CMM based on its construction. (10)

(ii) List out the advantages of CMM. (3)

14. (a) With a neat diagram explain how gear tooth thickness is measured using a gear tooth vernier caliper.

Or

(b) Derive the expression for tooth thickness of a gear in the constant chord method.

15. (a) With neat diagrams explain the working principle of rotameter and pitot tube.

Or

(b) With a neat diagram explain the working of bimetallic strip and thermocouple.

PART C — (1 × 15 = 15 marks)

16. (a) Calculate the tolerances, fundamental deviations and limits of sizes for the shaft designated as 40 H8/ f7. Standard tolerance for IT 7 is 16 i and IT 8 is 25 i. Where 'i' is the standard tolerance unit. Upper deviation for 'f' shaft is $- 5.5 D^{0.41}$, 40 mm lies in the diameter range 30 – 50 mm.

Or

(b) Design general type GO and NO GO gauges for a 40H7/ d8 fit. 40 mm lies in the diameter range 30 to 50. Show graphically the disposition of gauge tolerance zones relative to the work tolerance zones. Standard tolerance for IT7 is 16i and IT8 is 25i, where 'i' is the standard tolerance unit. The upper deviation for 'd' shaft is $-16 D^{0.44}$.