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Question Paper Code : 72155

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2017.

Fourth/Fifth Semester

Mechanical Engineering

ME 6504 — METROLOGY AND MEASUREMENTS

(Common to Materials Science and Engineering/Mechatronics Engineering)

(Regulations 2013)

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. Why is rocking procedure followed when measuring with a dial bore gauge?
4. Name any four instruments used measuring internal diameters in components.
5. What is meant by "Qualifying the tip" in CMMs?
6. Write any four applications of artificial vision systems in manufacturing industries.
7. Calculate the "best size wire" for checking the effective diameter of a $M10 \times 2.5$ thread.
8. Is assessment length greater/lesser than traverse length in surface finish measurement? Why?
9. What is meant by reliability of a measuring instrument?
10. Write the working principle of pyrometers.

PART B — (5 × 13 = 65 marks)

11. (a) Explain the various errors in measurements.

Or

- (b) What is the need of calibration? Explain the classification of various standards.

12. (a) Explain the construction and working principle of an autocollimator with a neat diagram.

Or

- (b) Explain the construction, working principle and applications of Sine Bar.

13. (a) Explain the working principle of AC LASER interferometer and how the straightness is measured?

Or

- (b) With neat diagram explain the working principle of touch trigger probes.

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 sketches explain the construction and working principle of the following :

(i) Rotameter

(ii) Resistance thermometer.

(2 × 6.5)

Or

- (b) With neat diagram explain the construction and working principle of the following :

(i) Pitot tube

(ii) Bi-Metallic strip.

(2 × 6.5)

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 16i and IT 8 is 25i. Where 'i' is the standard tolerance unit. Upper deviation for 'f' shaft is $-5.5D^{0.41}$, 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 $-16D^{0.44}$.