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Question Paper Code : 27375

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2015.

Fourth Semester

Material Science and Engineering

ME 6504 — METROLOGY AND MEASUREMENTS

(Common to B.E. Mechatronics Engineering and Mechanical Engineering)

(Regulations 2013)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is the difference between repeatability and reproducibility?
2. What is the difference between allowance and tolerance?
3. Write any two precautions to be followed when using gauge blocks.
4. Why are lasers used in metrology?
5. What are touch trigger probes?
6. What are diffraction gratings?
7. Define "material ratio" with reference to surface finish measurement.
8. How is roundness measured in the Least squares circle method?
9. Why are measuring instruments calibrated?
10. What is the working principle behind strain gauges?

PART B — (5 × 16 = 80 marks)

11. (a) What are the various elements of metrology? With examples, explain how these elements influence the accuracy of measurements?

Or

- (b) Explain with neat diagrams the method for measurement of straightness of a machine tool guide way using an Autocollimator. Show the tabulation to determine the error in straightness by choosing a reference line passing through the first and last points of the guide way.

12. (a) (i) With a neat diagram explain the working of angle dekkor. (12)
 (ii) Why are sine bars not used for measuring large angles? (4)

Or

- (b) Calculate the limits for a hole shaft pair designated 25 H8/d9. Show graphically the disposition of tolerance zones with reference to the zero line. The lower deviation for a H type hole is zero. 25 mm lies in the diameter range 18 mm to 30 mm. Standard tolerance for IT 8 is 25 i and IT 9 is 40 i, where "i" is the standard tolerance unit in microns and is given as $i(\mu m) = 0.45\sqrt[3]{D} + 0.001D$, (D is in mm). The upper deviation for 'd' shaft is $-16D^{0.44}$.
13. (a) (i) What is a Coordinate Measuring Machine? What are its basic elements? (6)
 (ii) Explain the working principle of a DC laser interferometer with a neat diagram. (10)

Or

- (b) Write briefly about the various stages involved in machine vision.
14. (a) (i) What is meant by functional inspection of gears? How is it done? (2)
 (ii) How is the tooth thickness of a gear measured in the base tangent method? Derive the expression for tooth thickness of a gear in this method. (14)

Or

- (b) (i) With a neat diagram explain the working principle of any one stylus type surface finish measuring instrument. (10)
 (ii) How is surface finish indicated in an engineering drawing? What are the various elements indicated in the symbol? (6)
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.