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B.E / B.Tech (Full Time) DEGREE END SEMESTER EXAMINATIONS, NOV / DEC 2012

B.E – MECHANICAL ENGINEERING

5TH Semester

21

ME 9311 – METROLOGY AND MEASUREMENTS

(Regulation 2008)

Time : 3 Hours

Answer ALL Questions

Max. Marks 100

PART-A (10 x 2 = 20 Marks)

1. What is the difference between repeatability and reproducibility?
2. Write **any two** advantages of comparators.
3. What is the difference between allowance and tolerance?
4. What are the precautions to be followed when using slip gauges?
5. Why are lasers used in metrology?
6. What are diffraction gratings?
7. Define bearing ratio.
8. How is roundness measured in the Least square circle method?
9. Why are measuring instruments calibrated?
10. What are strain gauges? Write **any two** of their applications in metrology?

Part – B (5 x 16 = 80 marks)

11. Design "general" type GO and NO GO gauges for a 40 H7/f8 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. The upper deviation for 'f' shaft is $-5.5D^{0.41}$. The tolerance grades IT 7 and IT 8 have values $16i$ and $25i$ respectively, where "i" is the standard tolerance unit in microns.
 12. a) (i) What are the various elements of metrology? How do they influence the accuracy of measurements? (10 marks)
(ii) With a neat diagram explain the working principle of **any one** mechanical comparator. (6 marks)
- OR**
- b) Explain with neat diagrams the method for measurement of straightness of a machine tool guideway 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 guideway.
13. a) (i) What is a Coordinate Measuring Machine (**CMM**)? List down all its basic elements. (4 marks)
(ii) How are CMMs classified based on their configuration? With neat diagrams explain the merits and demerits of **any two** of them. (12 marks)

OR

- b) (i) With a neat diagram explain how the laser interferometer could be used for measuring the linear accuracy of a machine tool guideway. (10 marks)
(ii) Write briefly about the various stages involved in machine vision. (6 marks)

14. a) (i) What is meant by functional inspection of gears? How is it done? (2 marks)
(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 marks)

OR

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

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

OR

- b) (i) With a neat diagram explain the working of **any one** instrument to measure torque. (8 marks)
(ii) What are the different types of probes available in CMMs? What are the merits of continuous scanning probes? Where are they used? (8 marks)