Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 71857

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2015.

Fifth Semester

Mechanical Engineering

ME 2304/ME 54/ME 1304/080120044/10122 ME 505 — ENGINEERING METROLOGY AND MEASUREMENTS

(Common to Production Engineering)

(Regulation 2008/2010)

(Common to PTME 2304/10122 ME 505 – Engineering Metrology and Measurements For B.E. (Part-Time) Fourth Semester – Mechanical Engineering – Regulation 2009/2010)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

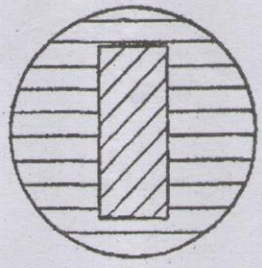
PART A — (10 × 2 = 20 marks)

1. Why measuring instruments should be calibrated?

2. Interpret the following geometric tolerance symbols.

3. Why are sine bars not used for measuring large angles?

4. A surface tested under an optical flat using an NPL flatness interferometer shows the following interference fringe pattern. Interpret the nature of the surface.



5. What is the difference between R_z and R_t?

6. What are thread gauges?

7. What is meant by "qualifying the tip" in CMMS?

8. What is machine vision?

9. Write any two advantages of thermocouples?

10. What is the Principle behind electrical resistance thermometer?

PART B — (5 × 16 = 80 marks)

11. (a) What are the good practices in measurement that need to be undertaken to get good measurement results? Give any four examples of errors which can be eliminated by such practices.

Or

(b) (i) What are the differences between repeatability and reproducibility conditions of measurement? (6)

(ii) Write short notes on interchangeable system of manufacturing. (10)

12. (a) (i) Why is a ratchet mechanism provided in a micrometer? With a neat diagram explain its function. (8)

(ii) What are the Precautions to be followed in the use of slip gauge blocks? (8)

Or

(b) Design "general" type GO and NO GO gauges for a 25 h7 shaft (The upper deviation for a 'h' type shaft is zero). 45 mm lies in the diameter range 18 mm to 30 mm. Standard tolerance for IT 7 is $16i$, 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). Show graphically the disposition of gauge tolerance Zones relative to the work tolerance Zones. Assume standard wear allowance and gauge maker's tolerance.

13. (a) (i) Write briefly about the following surface roughness Parameters – Evaluation length, Traverse length R_a and R_q. (8)

(ii) What are the various components of a surface profile? Why is surface finish measured? (8)

Or

(b) Derive the expression for tooth thickness of a gear in the base tangent method.

14. (a) (i) With a neat diagram explain the working principle of a heterodyne (two frequency) Laser interferometer. (12)

(ii) Show graphically the laser source and interferometer arrangement for measuring straightness errors along the main horizontal axis (x – axis) of a horizontal machining center. (4)

Or

(b) (i) How are Coordinate Measuring Machines (CMM) classified based on their construction? With neat diagram explain the merits and applications any one of them? (12)

(ii) Write any four applications of computer aided inspection. (4)

15. (a) (i) Write any four industrial applications of temperature measurement. (6)

(ii) Explain the construction and working principle of any one of the following.

(1) Bimetallic strip

(2) Optical Pyrometer. (10)

Or

(b) With neat diagrams explain the working of rotameter and pitot tube.

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