B.E / B.Tech (Full Time) DEGREE END SEMESTER EXAMINATIONS, APRIL / MAY 2012

(MATERIALS SCIENCE AND ENGINEERING BRANCH)

THIRD SEMESTER

ME9306 – METROLOGY AND MEASUREMENTS

(REGULATIONS 2008)

Time: 3hours Max Marks: 100

Answer ALL questions

PART A (10 x 2 = 20 Marks)

1. Why are standards important in metrology?
2. What is repeatability?
3. Show pictorially how the angle **$24^0 10' 18''$** could be assembled using the angle gauge set containing the following angle gauge blocks – 3", 6",18", 1', 3', 9', 27', 1^0, 3^0, 9^0, 27^0, 41^0.
4. What is Fundamental deviation?
5. List down the various stages of machine vision.
6. What are moiré fringes?
7. What is **"best size wire"** in screw thread measurement?
8. What are the different methods available for measuring straightness?
9. What are inferential flowmeters?
10. What are the advantages of pyrometers?

PART B (5 x 16 = 80 Marks)

11. (a) What are the various elements of metrology? How do they influence the accuracy of measurements? (12 marks)
    (b) Differentiate between accuracy and precision? (4 marks)

12. (a) Design "general" and "inspection" type GO and NO GO gauges for a 55 H7/f8 fit. 55 mm lies in the diameter range 50 to 80. Show graphically the disposition of gauge tolerance zones relative to the work tolerance zones. The upper deviation for 'f' shaft is $-5.5D^{0.41}$.

    or

    (b) (i) With neat diagram explain the construction and working principle of Alignment telescope. (12 marks)
    (b) (ii) Why are sine bars not used for measuring large angles. (4 marks)

13. (a) What are the various configurations available in CMMs? Write down any two merits and demerits of the different configurations with neat diagrams.

    or

    (b) (i) With a neat diagram explain the working principle of laser interferometer. (10 marks)
    (b) (ii) What is the role of machine vision in metrology today? (6marks)

14. (a) (i) Explain the working principle of NPL Flatness Interferometer. (4 marks)

(a) (ii) What are the different methods available for measuring the tooth thickness of gears? Explain with a neat diagram any one method. (12 marks)

or

(b) (i) With a neat sketch explain the working principle of roundness measuring instrument. (12 marks)

(ii) Define roundness error considering the **"minimum circumscribed circle"** as the reference circle. (4 marks)

15. (a) (i) With neat diagrams explain the working of any one instrument for measuring force. (6 marks)

(a) (ii) With neat sketches explain the working principle of venturi meter and orifice meter. (10 marks)

or

(b) (i) Write short notes on any two of the following (A) thermocouple (B) bimetallic strip and (C) electrical resistance thermometer. (10 marks)

(ii) Explain the working principle of any one pressure measuring instrument. (6 marks)