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

(MECHANICAL ENGINEERING BRANCH)

(39)

FIFTH SEMESTER

ME9306 – METROLOGY AND MEASUREMENTS

(REGULATIONS 2008)

Time: 3hours Max Marks: 100

Answer ALL questions

PART A (10 x 2 = 20 Marks)

1. What is the role of metrology in today's manufacturing environment?
2. What is true value of measurement?
3. What are slip angles? Write down the minimum number of slip gauges required to build up the dimension 46.635 mm.
4. What is Taylor's principle of gauging?
5. How can CMMs be calibrated?
6. What are moiré fringes?
7. Differentiate between functional and analytical inspection of gears.
8. Define flatness.
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 errors which occur during measurements? How can they be reduced or eliminated? (12 marks)
    (b) Differentiate between accuracy and precision? (4 marks)

12. (a) Design "general" and "inspection" type GO and NO GO gauges for a 60 H7/f8 fit. 60 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) What are sine bars? With neat diagrams explain how the sine bar can be used for angle measurement of small and large components. (12 marks)
    (b) (ii) what are the various design requirements of a sine bar. (4 marks)

13. (a) What are the various types of probes available in CMMs? Explain the merits and demerits of the different probes.

    or

    (b) (i) With a neat diagram explain the working principle of laser interferometer. (10 marks)

    (ii) What are the advantages of machine vision in measurements? (6marks)

    Explain the working principle of NPL Flatness Interferometer. (10marks)

(a) (ii) What is meant by best size wire in thread measurement? Derive the expression for the same. (6marks)

or

(b) A measuring machine bed was tested for straightness using an autocollimator and reflector. The heights of the various points (corresponding to various positions of the reflector along the bed) from the optical axis of the autocollimator are given in the table. The distance between the support feet of the reflector is 100 mm.

Points	Height (microns)
a	3
b	5
c	4
d	1
e	2

i Construct a profile graph of the surface relative to the initial points a,b and find the maximum deviation from a line through the end points. (8 marks)

ii Determine the equation of the best fit line using the principle of least squares. (8 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) What is thermometric property? With neat sketches write short notes on (i) thermocouple (ii) bimetallic strip and (iii) electrical resistance thermometer.