B. Tech 4th Semester Examination
Metrology and Interchangeability (O.S.)
ME-4001

Time : 3 Hours Max. Marks : 100

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt five questions in all selecting atleast one question from each section A, B, C & D of the question paper. All sub parts of section E is compulsory. All questions carry equal marks.

SECTION - A

1. (a) Distinguish between 'Precision' and 'Accuracy' with suitable examples.

(b) Sketch a vernier caliper and name its different parts. Explain how will you measure the thickness of a plate by the vernier caliper?

(c) Distinguish between Line Standards and End Standards. How are End Standards derived from Line Standards?

(4+8+8)

2. (a) Distinguish between static and dynamic measurements. What are the different sources of errors? Explain.

(b) Explain principle of compound gearing method for mechanical measurement.

(10+10)

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SECTION - B

3. (a) Explain the meaning of the following terms:
   (i) Hole Basis system, stating why it is recommended;
   (ii) Unilateral and Bilateral limits.

   (b) What is a sine bar? With a neat diagram, explain how this is used?

   (c) State the importance of limits and fits in large scale production. Describe any system of setting limits and fits you know. (4+8+8)

4. (a) Name the various types of comparators used in industry and explain the construction and working of optical comparators.

   (b) Explain the working principle of autocollimator and how the straightness is measured? (10+10)

SECTION - C

5. (a) Explain the use of an optical flat to test the flatness of measuring surfaces.

   (b) Describe the flatness testing using autocollimator method. (10+10)

6. Describe the following:
   (a) Thread caliper gauges
   (b) Errors in thread. (2x10=20 )

SECTION - D

7. (a) Draw the geometry of spur gear and explain the different terminology associated with it.

   (b) With a neat sketch, describe the construction and working of a profilometer. (10+10 )
8. (a) Explain the principle of inspecting involute profile of gear tooth.

(b) What are the different methods used for the measurement of surface finish? Explain the working of the Tomlinson surface meter. (10+10)

SECTION - E


(ii) Enumerate any four angular measuring instruments and their accuracies.

(iii) What is the helix angle of M50 x 2 threads?

(iv) What is the tooth thickness of gear of module 5 mm and number of teeth 30?

(v) How does a selective assembly differ from an interchangeable manufacture?

(vi) What are the considerations for deciding the limits on the limit gauges?

(vii) Explain the principle of measurement by light-wave interference method.

(viii) What is meant by roughness and waviness of machined surfaces?

(ix) What are the various types of pitch errors on thread components and what is the difference between them?

(x) What is the working principle and applications of an Auto-Collimator? (10×2=20)