Code No: RR320302 **Set No. 1**

III B.Tech II Semester Supplimentary Examinations, Aug/Sep 2007
METROLOGY
(Mechanical Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Define terms: Clearance; interference; allowance fit. Draw a conventional diagram for explicit representation of these terms on a shaft and hole pair
   (b) The hole and shaft assembly of 90mm nominal size have tolerances specified as $90^{+0.05}_{-0.00}$mm for hole and $90^{-0.03}_{+0.05}$mm for shaft. Determine
      i. Maximum and minimum clearance (interference) attainable
      ii. Allowance
      iii. Hole and shaft tolerances
      iv. Fundamental deviation
      v. MML for shaft and hole
      vi. Type of fit.
      Sketch these values on a conventional diagram. [8+8]

2. (a) Describe with a neat sketch the working of an outside micrometer to an accuracy of 0.001mm.
   (b) Explain terms line standards and end standards with examples. [8+8]

3. (a) Sketch two forms of sine bars with nomenclature as recommended by IS:5359-1969
   (b) Show the arrangement of angle gauges with neat sketches to measure
      i. 33^0 - 9' - 15" and
      ii. 102^0 - 8' - 42" with minimum number of gauges from a set of

      $[1^0, 3^0, 9^0, 27^0, 41^0]$
      [1', 3', 9', 27'] and
      [3", 6", 18", 38"] [8+8]

4. (a) Explicate
      i. position gauge
      ii. snap gauge with sketches.
   (b) Design and sketch a working gauge with a GO and NO-GO ends for spindle $\frac{80.009}{80.000}$ mm and a hole of $\frac{79.866}{79.786}$ mm. [6+10]

5. Elucidate the working principles of
   (a) Autocollimator
   (b) Optical projector

(c) Straight edge [6+5+5]

6. (a) Explain terms R_a and R_z values
   (b) Describe evaluation of surface finish by
      i. Peak to valley height method
      ii. The average roughness method. [6+10]

7. (a) Differentiate between measuring instrument and comparator.
   (b) Enumerate various equipment desirable for alignment tests on lathe. Enlist various such tests for lathe. [6+10]

8. (a) Describe pitch measurement of internal and external screw threads by pitch measuring machine .
   (b) Enumerate various types of errors in gear. [8+8]

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Code No: RR320302 **Set No. 2**

III B.Tech II Semester Supplimentary Examinations, Aug/Sep 2007
METROLOGY
(Mechanical Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Identify the type of the following fits and specify shaft based fit equivalent to each of them.
   i. $H_{11} - e_{11}$
   ii. $H_6 - u_5$
   iii. $H_8 - k_8$
   (b) Determine and sketch the limits of tolerance and allowance for a 60mm shaft and hole pair designated $H_7 - k_8$. The basic size lies in the range of 50-80mm. The multipliers for grades 7 and 8 are 16 and 25 respectively. The fundamental deviation for 'k' shaft is $(+0.6\ D^{0.33})$ microns. [6+10]

2. (a) Enumerate various types of outside micrometers and their uses.
   (b) What are line standards? Explain with examples, the characteristics of line standards. [10+6]

3. Discuss various methods of taper measurement of plug and ring gauges. [16]

4. (a) Elucidate terms : gauges tolerance and wear allowance as assignable to limit gauges.
   (b) Design general type GO and NO-GO gauges for components having 65 H7/m6 fit. The basic size falls in the diameter range of 50-80mm. The fundamental deviation for 'm' shaft=(IT7 -IT6) microns. The multipliers for 7 and 6 grades are 16 and 10. Take wear allowance as 10% of gauge tolerance. Sketch the gauges with values. [6+10]

5. Explicate measurement of flatness by
   (a) Straight edge
   (b) Spirit level
   (c) Optical Flat [5+5+6]

6. (a) What are the factors affecting surface roughness? What is the necessity for controlling the surface texture?
   (b) Explicate the details of construction, principle and operation of stylus. [8+8]

7. (a) Explain how the principle of visual gauging heads is incorporated in multi gauging machines.

(b) Enumerate the various equipments and their essential precision and accuracy levels for performing alignment tests. [6+10]

8. (a) Enumerate various screw thread parameters for metrological measurement. Also enlist instruments corresponding to their measurements.

(b) Describe with the help of a neat sketch the working of "Gear tooth vernier caliper". [8+8]

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Code No: RR320302 **Set No. 3**

III B.Tech II Semester Supplimentary Examinations, Aug/Sep 2007
METROLOGY
(Mechanical Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Identify the type of the following fits and specify shaft based fit equivalent to each of them.
   i. $H_{11} - e_{11}$
   ii. $H_6 - u_5$
   iii. $H_8 - k_8$
   (b) Determine and sketch the limits of tolerance and allowance for a 60mm shaft and hole pair designated $H_7 - k_8$. The basic size lies in the range of 50-80mm. The multipliers for grades 7 and 8 are 16 and 25 respectively. The fundamental deviation for 'k' shaft is $(+0.6\ D^{0.33})$ microns. [6+10]

2. (a) Describe the general case of slip gauges before and after use. Build up slip gauges from M87 set for measurement of 29.758mm.
   (b) Explain by means of a simple line diagram the operating mechanism of a plunger type dial test indicator. Explain the magnification obtained by dial indicator. [8+8]

3. Discuss various methods of taper measurement of plug and ring gauges. [16]

4. (a) Explicate the classification of plain limit gauges.
   (b) Design general type GO and NO-GO gauges for components having 25 H8/f9 fit. The basic size falls in the diameter range of 18-30mm. The fundamental deviation for 'f' shaft=$(-5.5\ D^{0.4})$ microns. The multipliers for 8 and 9 grades are 25 and 40. Take wear allowance as 10% of gauge tolerance. Sketch the gauges with values. [6+10]

5. Describe with a sketch the working principle of an autocollimator. What is meant by flatness? How is it measured with autocollimator? What are the uses of the instrument? [16]

6. (a) What are the factors affecting surface roughness? What is the necessity for controlling the surface texture?
   (b) Explicate the details of construction, principle and operation of stylus. [8+8]

7. (a) Enumerate various characteristics of a good comparator.
   (b) Explain the working of sigma comparator with special reference to cross strip lever in detail. [6+10]

8. Describe the pitch measurement of internal and external screw threads by various methods. [16]

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Code No: RR320302 **Set No. 4**

III B.Tech II Semester Supplimentary Examinations, Aug/Sep 2007
METROLOGY
(Mechanical Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Identify the type of the following fits and specify shaft based fit equivalent to each of them.
   i. $H_9 - h_{11}$
   ii. $H_6 - p_7$
   iii. $H_5 - g_8$
   (b) Determine and sketch the limits of tolerance and allowance for a 70mm shaft and hole pair designated $H_8 - n_9$. The basic size lies in the range of 50-80mm. The multipliers for grades 8 and 9 are 25 and 40 respectively. The fundamental deviation for 'n' shaft is $(+5\ D^{0.34})$ microns. [6+10]

2. (a) Describe taking linear measurements with "inside micrometer"
   (b) Describe the calibration of slip gauges by Eden-Rolt millionth comparator. [8+8]

3. Discuss various methods of taper measurement of plug and ring gauges. [16]

4. (a) Enumerate and explicate various types of limit gauges for tapers .
   (b) Design and sketch a working gauge with a GO and NO-GO ends for spindle $\frac{48.960}{48.926}$ mm and a hole of $\frac{49.050}{49.001}$ mm. [6+10]

5. Explicate the principle of operation of optical flats. How flatness is tested with optical flats? [16]

6. (a) What are the factors affecting surface roughness? What is the necessity for controlling the surface texture?
   (b) Explicate the details of construction, principle and operation of stylus. [8+8]

7. (a) Elucidate the working principle of Eden-Rolt millionth comparator.
   (b) Enumerate various alignment tests on milling machine. [8+8]

8. (a) Elucidate the Effective diameter measurement by two wire method
   (b) Explicate gear metrology of spur gears with reference to
   i. Lead
   ii. pitch [8+8]

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