USN ☐☐☐☐☐☐☐☐☐☐ 　　　　　10ME42B/AU42B/PM42/TL42

Fourth Semester B.E. Degree Examination, December 2012
Mechanical Measurement and Metrology

Time: 3 hrs. 　　　　　　　　　　　　　　　　　　　　　　Max. Marks:100

Note: *Answer any FIVE full questions, selecting atleast TWO questions from each part.*

PART – A

1 　a. Explain international prototype meter, with sketch. 　　　　　　　　　　(06 Marks)
　　b. What are Airy points? Where are the airy points located on 600mm bar? 　(04 Marks)
　　c. Using a set of M112 slip gauges, build the following dimensions :
　　　　i) 49.3115 　　　ii) 68.208 　　　iii) 52.496 　　　iv) 78.3665. 　(10 Marks)

2 　a. Explain Indian Standard (IS919 – 1963) along with the concept of limit, size and tolerance, with the neat diagram. 　　　　　　　　　　　　　　　　　　(05 Marks)
　　b. Compare the following :
　　　　i) Build – up tolerance and Compound tolerance 　　ii) Interchangeability and selective assembly. 　　　　　　　　　　　　　　　　　　　　　　　　　　(05 Marks)
　　c. State the Taylor's principle and design the gauges to measure the fit designated by $50E_4 f_8$ which is produced by mass production. Given 　i) 50mm lies between 30 to 50mm
　　　　ii) $i = 0.45\sqrt[3]{D} + 0.001D$ 　　iii) Fundamental deviation for hole is $11D^{0.41}$.
　　　　iv) Fundamental deviation for shaft is $-5.5D^{0.41}$.
　　　　v) Tolerance grade for IT4 and IT8 is "5i" and "25i".
　　　　Write the type of fit for $50E_4 f_8$ and express the value in unilateral dimension. 　(10 Marks)

3 　a. Explain the working of a sigma comparator, with a sketch. 　　　　　　(10 Marks)
　　b. With a neat diagram, explain the principle of working of LVDT. 　　　(06 Marks)
　　c. Select the sizes of angle gauges required to build, the angle 570 34' 9", show the arrangement of gauges. 　　　　　　　　　　　　　　　　　　　　(04 Marks)

4 　a. With a neat sketch, explain the working principle of an auto collimeter. 　(06 Marks)
　　b. Define "effective diameter" and "best size wire". Derive an expression to determine the best size wire diameter. 　　　　　　　　　　　　　　　　　　　　(08 Marks)
　　c. How do you measure the chord thickness of spur gear tooth using gear tooth vernier? Explain with a sketch. 　　　　　　　　　　　　　　　　　　　(06 Marks)

PART – B

5 　a. Explain the concept of "generalized measurement system", with block diagram taking the working of bourdon pressure gauge as an example. 　　　　　　　　(08 Marks)
　　b. Explain any three system response characteristics. 　　　　　　　　(06 Marks)
　　c. Classify and sub classify errors. Explain briefly each type of error, with example and how it can be reduced. 　　　　　　　　　　　　　　　　　　　　(06 Marks)

6 　a. Sketch and explain the platform balance method of measuring force. 　(06 Marks)
　　b. With a neat sketch, explain the working of hydraulic dynamometer. 　(06 Marks)

c. Write a note on X – Y plotters. **(08 Marks)**

7 a. Explain the inherent problem present in mechanical intermediate modifying systems.
(06 Marks)
   b. Explain the working of "Cathode Ray Oscilloscope". **(06 Marks)**
   c. What are electronic amplifiers? With a neat sketch, explain chopper amplifier. **(08 Marks)**

8 a. State and explain the laws of thermocouple. **(06 Marks)**
   b. Explain the principle and working of unbonded and bonded electrical strain gauges.
(06 Marks)
   c. Write notes on any two of the following :
      i) Gauge factor and cross sensitivity.
      ii) Temperature compensation in resistance type strain gauges.
      iii) Calibration of strain gauges.
      iv) Wheat stone bridge arrangement for strain measurement. **(08 Marks)**

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