USN ☐☐☐☐☐☐☐☐☐☐ **10ME/AU/PM/TL42B**

Fourth Semester B.E. Degree Examination, June 2012
Mechanical Measurements and Metrology

Time: 3 hrs.   Max. Marks:100

Note: 1. *Answer any FIVE full questions, selecting atleast TWO*
questions from each part.
2. *Draw neat sketch, wherever necessary.*

PART – A

1 a. With a sketch, explain anyone type of material length standard. What are the disadvantages and advantages of material length standards? **(08 Marks)**
 b. Using NPL method, derive equation for calibrating end standards from line standards. **(08 Marks)**
 c. What are Airy points? Explain in detail. **(04 Marks)**

2 a. With the help of sketch, define the following Zero line, Basic size, Limits, Allowances, Deviation, Upper deviation, Lower deviation and Fundamental deviation. **(08 Marks)**
 b. What is the difference between unilateral and bilateral tolerances? Which is the most suitable tolerance method and why? **(06 Marks)**
 c. Determine the type of fit after deciding the fundamental deviations and tolerances in the following : Fit = 70 H_9/e_7 ; Diameter step 50 to 80 ;
 Fundamental deviation for shaft = $-11 D^{0.41}$ in micron ;
 $IT_7 = 16i$ and $IT_9 = 40i$; $i = 0.45\sqrt[3]{D} + 0.001D$ in micron. **(06 Marks)**

3 a. Explain with neat sketch, the construction and working principle of LVDT. **(08 Marks)**
 b. Describe the working of a vernier bevel protractor, with a neat sketch. **(06 Marks)**
 c. Explain the principle of sine bar. **(06 Marks)**

4 a. Draw a neat sketch of a toolmakers microscope and explain briefly the construction and uses. **(08 Marks)**
 b. Describe the 3 – wire method of measuring effective diameter of threads and derive the equation for the same. **(08 Marks)**
 c. Illustrate the use of gear tooth caliper to measure tooth thickness. **(04 Marks)**

PART – B

5 a. Explain the three stages of generalized measuring method, using any one example. **(08 Marks)**
 b. Explain the following, with respect to an instrument : i) Sensitivity ii) Threshold iii) Hysteresis and iv) Loading effect. **(08 Marks)**
 c. What is the significance of measurement system? **(04 Marks)**

6 a. With an example, explain primary and secondary transducer. (08 Marks)
   b. Explain with sketches, variable self – inductance (both single and two coils) transducers.
       (06 Marks)
   c. Explain with sketches i) Photoelectric transducers ii) Photoconductive transducer.
       (06 Marks)

7 a. Explain hydraulic dynamometer, with a neat sketch. What are the advantages of hydraulic dynamometers over mechanical brakes? (08 Marks)
   b. Explain with sketch, working of proving ring. (08 Marks)
   c. What are the methods of force measurement? Give examples. (04 Marks)

8 a. Explain with neat sketch, the working principle of resistance thermometer. (08 Marks)
   b. Explain using neat sketch, working principle of null balance type strain measurement.
       (08 Marks)
   c. Explain law of intermediate temperature, with figure. (04 Marks)

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