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10ME42B/AU42B/TL42

Fourth Semester B.E. Degree Examination, June/July 2013
Mechanical Measurements and Metrology

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Define metrology. What are the objectives of metrology from industrial point of view? **(06 Marks)**

b. Describe with neat sketch, i) Imperial standard yard ii) International prototype meter. **(10 Marks)**

c. Build a dimension of 35.4875 mm using M112 sets. **(04 Marks)**

2 a. A hole and a shaft pair has the following designation 70H8e9. The diameter falls in the step of 50–80 mm. Given $i = 0.45(D)^{\frac{1}{3}} + 0.001D$, where D is in mm and i is in microns. Fundamental deviations for "e" type shaft is $-11D^{0.41}$.

i) Calculate the limits for both shaft and hole.
ii) Mention the type of fit and the allowance
iii) Design GO and NO-GO gauges as per British system in which same gauges are used for inspection and workshop.
iv) IT8 = 25i and IT9 = 40i.
v) Sketch the gauges designed by you. **(16 Marks)**

b. What is the difference between unilateral and bilateral tolerances? **(04 Marks)**

3 a. What are comparators? How do they differ from the measuring instruments? **(04 Marks)**

b. Explain with a neat sketch the construction and working of a Johansson's Mikrokator. **(08 Marks)**

c. Explain with a neat sketch the construction and working of an LVDT. **(08 Marks)**

4 a. What is the best size wire? Derive the expression for the same in terms of the pitch and angle of the thread. **(08 Marks)**

b. Explain 3-wire method of measuring effective diameter of screw thread. **(06 Marks)**

c. Explain how chordal addendum is measured by using geartooth vernier caliper. **(06 Marks)**

PART – B

5 a. With a neat block diagram, explain the three stages of a generalized measurement system with an example. **(10 Marks)**

b. Define an error and explain the classification of errors. **(10 Marks)**

6 a. With a neat block diagram, explain the working principle of a CRO. **(10 Marks)**

b. With a block diagram, explain the working of an X-Y plotter. **(10 Marks)**

7 a. Explain with a neat sketch, the working of McLeod gauge. **(08 Marks)**

b. Explain with neat sketch, the working of Hydraulic Dynamometer. **(06 Marks)**

c. With a neat sketch, explain the working principle of proving ring. **(06 Marks)**

8 a. What are thermocouples? State the laws of thermocouple. **(04 Marks)**

b. Derive the expression for the gauge factor of the strain gauges in terms of Poisson's ratio. Why gauge factor is less than two for most of the materials? **(08 Marks)**

c. Sketch and explain the working principle of an optical pyrometer. **(08 Marks)**

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