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10ME42B/AU42B/TL42

Fourth Semester B.E. Degree Examination, Dec.2014/Jan.2015
Mechanical Measurements and Metrology

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Define metrology. What are the objectives of metrology? **(05 Marks)**

b. Explain "Imperial standard yard" and "International prototype meter" with neat sketches. **(10 Marks)**

c. A calibrated meter end bar has an actual length of 1000.0002 mm. It is used in calibration of two bars A and B, each having a basic length of 500 mm. When compared with the meter bar $L_A + L_B$ was found to be shorter by 0.0003 mm. In comparing A and B, it was found that A was 0.0004 mm longer than B. Find the actual length of A and B. **(05 Marks)**

2 a. Differentiate : i) unilateral and bilateral tolerances ii) clearance fit and interference fit. **(06 Marks)**

b. Determine the dimensions of shaft and hole for a fit 30 H_7f_8. The given data are : $i = 0.45\sqrt[3]{D} + 0.001D$ microns. Fundamental deviation for f shaft is $-5.5D^{0.41}$ microns, 30 mm falls in the diameter step of 18 and 30. Tolerance grade for IT_7 and IT_8 are 16i and 25i respectively. Also design plug gauge to check the above hole. Take wear allowance as 10% of the gauge tolerance. **(10 Marks)**

c. Explain : i) Shaft basis system ii) Hole basis system. **(04 Marks)**

3 a. With a neat sketch, explain the construction and working of Johannson Mikrokator comparator. **(08 Marks)**

b. Explain with a neat sketch, the working of Solex pneumatic comparator. What are its advantages? **(08 Marks)**

c. Explain the principle of sine bar. **(04 Marks)**

4 a. With a neat sketch, explain the working principle of an autocollimator. **(06 Marks)**

b. Define "Effective diameter". Explain the 3-wire method of finding the effective diameter of screw threads. **(08 Marks)**

c. Explain with a sketch, how the chordal thickness is measured by using gear tooth vernier caliper. **(06 Marks)**

PART – B

5 a. Define measurement. With a block diagram, explain the generalized measurement system with a suitable example. **(08 Marks)**

b. Define the following terms : i) precision ii) hysteresis iii) sensitivity. **(06 Marks)**

c. Explain the principle of capacitive type electrical transducer. With a sketch explain any one type of capacitive transducer. **(06 Marks)**

6 a. Explain the inherent problems present in mechanical modifying system. **(06 Marks)**

b. With a block diagram, explain the general telemetering system. **(06 Marks)**

c. Explain with neat sketches : i) stylus type oscillograph ii) x – y – plotter. **(08 Marks)**

7 a. Sketch and explain the analytical balance (equal arm balance). **(08 Marks)**

b. Explain how the torque is measured using prony brake dynamometer. What are its disadvantages? **(06 Marks)**

c. Describe the working principle of pirani gauge with a sketch. **(06 Marks)**

8 a. State the laws of thermocouples. **(04 Marks)**

b. Explain the construction and working of optical pyrometer. **(08 Marks)**

c. Define gauge factor. Explain the wheat stone bridge arrangement for strain measurement. **(08 Marks)**

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