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10ME/AU42B

Fourth Semester B.E. Degree Examination, Dec.2016/Jan.2017
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. What is metrology? Explain with necessary sketch the imperial standard yard and high light the significance of Airy points. (09 Marks)
- b. Four length bars A, B, C, D of approximately 250mm each are to be calibrated with standard metre bar which is actually 0.0008mm less than a metre. It is also found that bar B is 0.0002mm longer than bar A, Bar 'C' is 0.0004mm longer than bar A and bar D is 0.0001mm shorter than bar A. (07 Marks)
- c. Build up slip gauges for 92.357mm. (04 Marks)
- 2 a. Explain briefly the difference between the inter changeable manufacture and selective assembly. (04 Marks)
- b. Calculate the dimensions of plug and ring gauges to control the production of 50mm shaft and hole pair of H₇d₈ as per IS specifications. The following assumptions may be made: 50mm lies in diameter step of 30 to 50mm and the upper deviation for 'd' shaft is given by $-16 D^{0.44}$ and lower deviation for hole H is zero. Tolerance unit $i(\text{micron}) = 0.45 \sqrt[3]{D} + 0.001D$ and IT6 = 10i above IT6 grade the tolerance magnitude is multiplied by 10 at each fifth step. (16 Marks)
- 3 a. Explain with necessary sketch the working principle of solex pneumatic comparator. (08 Marks)
- b. List the advantages and disadvantages of mechanical comparator. (05 Marks)
- c. Explain with neat sketches the use of sine bar for measuring known and unknown angles. (07 Marks)
- 4 a. Explain the procedure to measure the tooth thickness of a spur gear using a gear tooth vernier caliper. (08 Marks)
- b. Explain with necessary sketch the working principle of optical flat. (06 Marks)
- c. Derive an expression for best size wire. (06 Marks)

PART – B

- 5 a. Differentiate between accuracy and precision. (04 Marks)
- b. Explain with necessary block diagram the elements of generalized measurement system. (08 Marks)
- c. Explain the following with respect to measuring instrument: i) Calibration; ii) Threshold; iii) Sensitivity; iv) Hysteresis. (08 Marks)
- 6 a. Explain the inherent problems observed in mechanical type intermediate modifying devices. (06 Marks)
- b. Explain with necessary circuit the following electrical intermediate modifying devices: i) Input circuitry; ii) The Ballast circuit. (08 Marks)
- c. With a neat sketch explain the working of oscillograph. (06 Marks)
- 7 a. With a neat sketch, explain the working principle of analytical balance. (08 Marks)
- b. Explain with a neat sketch the working of hydraulic dynamometer. (08 Marks)
- c. Explain with a neat sketch the working of proving ring. (04 Marks)
- 8 a. Explain two laws of thermocouple governing the working of thermocouple. (06 Marks)
- b. Explain with basic wheat stone bridge circuit the methods of strain measurement. (08 Marks)
- c. Explain the steps in strain gauge mounting. (03 Marks)
- d. What is gauge factor? (03 Marks)

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Important Note: 1. On completing your answers, comparatively draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.