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10ME32B/AU32B

Third 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. What is metrology? State the objectives of metrology. (06 Marks)
- b. Briefly explain limits, fits and tolerances. (06 Marks)
- c. Using M112 set of slip gauges, build the following dimensions:
 - i) 52.498
 - ii) 48.3275 (08 Marks)

- 2 a. Explain universal interchangeability and selective assembly. (06 Marks)
- b. What do you understand by line and end standard? Explain wavelength standard. (06 Marks)
- c. Determine the tolerances on the hole and the shaft for a precision running fit designated by 50 H7g6. Given:
 - i) 50 mm lies between 30-50 mm
 - ii) i (microns) = $0.45(D)^{1/3} + 0.001D$
 - iii) Fundamental deviation for 'H' hole = 0
 - iv) Fundamental deviation for 'g' shaft = $-2.5 D^{0.34}$
 - v) 1T7 = 16i
 - vi) 1T6 = 10i
 State the actual maximum and minimum sizes of the hole and shaft and maximum and minimum clearances. (08 Marks)

- 3 a. What is a comparator? Explain Johnson Mikrokartor comparator with a neat sketch. (06 Marks)
- b. What are the advantages of electrical comparators? Explain the principle of optical comparator. (07 Marks)
- c. Describe with a neat sketch, the construction and working of LVDT. (07 Marks)

- 4 a. Explain with a neat sketch the terminology of screw threads. (06 Marks)
- b. Explain the principle of autocollimator with a neat sketch. (06 Marks)
- c. Derive an expression for the effective diameter of a screw thread by 3-wire method. (08 Marks)

PART – B

- 5 a. Explain with suitable examples, the three stages of measurement system. (06 Marks)
- b. Define:
 - i) Calibration
 - ii) Precision
 - iii) Accuracy
 - iv) Sensitivity
 - v) Linearity. (10 Marks)
- c. Compare electrical and mechanical transducers. (04 Marks)

Important Note : 1. On completing your answers, compulsorily 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.

- 6 a. Explain with a sketch, the principle of:
i) piezo-electric transducer (08 Marks)
ii) ionization transducer. (06 Marks)
- b. Explain with a block diagram, the general telemetering system. (06 Marks)
- c. Explain the working of:
i) stylus type oscillograph (06 Marks)
ii) x-y plotter.
- 7 a. Explain with a neat sketch, multiple lever platform balance. (06 Marks)
- b. What are the types of dynamometers? Explain with a neat sketch, hydraulic dynamometer. (08 Marks)
- c. Explain the operation of McLeod gage and pirani gage. (06 Marks)
- 8 a. What are the methods of strain measurement? Explain the principle of electrical resistance strain gauge. (06 Marks)
- b. What is a thermocouple? Briefly explain the laws of thermocouple. (06 Marks)
- c. Write notes on:
i) Strain gauge factor
ii) Temperature compensation
iii) Cross sensitivity
iv) Strain gauge bonding materials. (08 Marks)

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