

CBCS SCHEME

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18AE36

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020

Measurement and Metrology

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Describe with a neat sketch, the constructional features of an International Prototype Meter. (08 Marks)
- b. Using NPL method, derive equation for calibrating end standards from line standards. (08 Marks)
- c. Write a brief note on the manufacture of slip gauges. (04 Marks)

OR

- 2 a. State and explain the objectives of Metrology. (05 Marks)
- b. State at least three important characteristics of Line standard and End standard instruments. (05 Marks)
- c. Three 100mm end bars are measured on a level comparator by first wringing them together and comparing with a 300mm bar. The 300mm has a known error of + 40 μ m and the three bars together measure 64 μ m less than the 300mm bar. Bar A is 18 μ m longer than bar B and 23 μ m longer than Bar C. Find the actual length of each bar. (10 Marks)

Module-2

- 3 a. Explain the principles of Interchangeability and selective assembly. (06 Marks)
- b. Discuss hole based and shaft based system of fits with neat sketch. (08 Marks)
- c. Determine the dimensions of the shaft and hole for a fit H₈/d₁₀ and sketch the fit, given the following data :
 - i) Diameter 30 falls in the dia range 18 – 30 , Upper deviation for 'd' shaft is -16D^{0.44}.
 - ii) $i = 0.45D^{1/3} + 0.001D$. Tolerance for IT8 = 25i. Tolerance for IT10 = 64i. (06 Marks)

OR

- 4 a. State and explain Taylor's principle of gauge design. (08 Marks)
- b. With a neat sketch, explain any two type of plug and ring gauges. (06 Marks)
- c. What are the essential considerations in selection of materials for gauges and what are the common materials used for gauges? (06 Marks)

Module-3

- 5 a. With neat sketch, describe the construction and working of sigma comparator. (10 Marks)
- b. Explain the principle of Zeiss Ultra Optimeter, with a neat sketch. (10 Marks)

OR

- 6 a. Sketch and explain in detail working of back pressure type pneumatic comparator. (10 Marks)
- b. With a neat sketch, explain the optical bevel protractor. (10 Marks)

Module-4

- 7 a. Describe the three stages of measurement with a suitable example. (10 Marks)
- b. Elaborate the significance of the following terms with reference to measurement :
 - i) Accuracy
 - ii) Precision
 - iii) Linearity
 - iv) Repeatability
 - v) Resolution. (10 Marks)

OR

- 8 a. Give the detailed classification of errors in measurement and also state the factors responsible for the above errors. (10 Marks)
- b. Explain with sketch, the construction and working of electro kinetic transducers. State its applications and limitations. (10 Marks)

Module-5

- 9 a. With the help of neat sketch, explain the working principle of prony brake dynamometer. (10 Marks)
- b. Describe the construction and working of optical pyrometer. (10 Marks)

OR

- 10 a. With a neat sketch, explain the Tuckerman optical extensometer. Give their advantages and disadvantages. (10 Marks)
- b. Explain the electrical resistance unbounded strain gauge and bonded strain gauge, with neat sketch. (10 Marks)

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