

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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