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 + 40μm and the three bars together measure 64 μm less than the 300mm bar. Bar A is 18μ m longer than bar B and 23μm 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 H_8/d_{10} 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 teams 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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