USN | | | | | | | | | **171446B/17MEB406**

Fourth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Mechanical Measurements and Metrology

Time: 3 hrs.   Max. Marks: 100

Note: Answer ant' FIVE fall questions, choosing ONE full question from each module.

Module-1

1 a. Define Metrology. What are the objectives of metrology? **(06 Marks)**
   b. Differentiate line and end standards with examples. **(06 Marks)**
   c. Four length bars A, B, C, D of approximately 250mm each are to be calibrated with standard calibrated 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 '13" is 0.0001mm shorter than bar 'A'. The length of all four bars put together is 0.0003mm longer than the calibrated standard metre. Determine the actual dimensions of each bar. **(08 Marks)**

OR

2 a. Explain with neat sketches wringing phenomena of slip gauges. **(06 Marks)**
   b. Build the following lengths by using M-112 set of slip gauges and write their combinations:
      i) 29.875mm   ii) 101.345mm   iii) 78.3665mm **(09 Marks)**
   c. Explain with neat sketches how a sine bar can be used to measure an unknown angle. **(05 Marks)**

Module-2

3 a. Define tolerance with types. **(06 Marks)**
   b. Define fit. Explain different types of fits with sketches. **(08 Marks)**
   c. Discuss hole and shaft basic system with neat sketches. **(06 Marks)**

OR

4 a. List essential considerations and materials used for construction of gauges. **(04 Marks)**
   b. Determine the tolerances on the hole and the shaft for a precision running fit designated by 501-17g6. Given:
      i)   50mm lies between 30-50 mm
      ii)   i(Microns) = 0.45 (D)" + 0.001D
      iii) Fundamental deviation for, **H = 0**
      iv)   Fundamental deviation for "g" shaft = -2.5D$^{\circ 34}$.
      v)   ITS = 16i and IT6 = 10i **(08 Marks)**
   c. Explain with neat sketches double ended plug and snap gauges. **(08 Marks)**

Module 3

5 a. Explain terminology of screw thread. **(06 Marks)**
   b. Derive an equation for measuring effective diameter of screw thread by using 2-wire method. **(08 Marks)**
   c. With neat sketch, explain tool Maker's microscope. **(06 Marks)**

OR

6   a. Illustrate the principle of interferometry with sketches. **(10 Marks)**
      b. Explain construction and working of co-ordinate measuring machine. **(10 Marks)**

Module 4

7   a. Explain the concept of generalized measurement system with block diagram with bourdon pressure gauge as an example. **(08 Marks)**
      b.   Define the following terms: i) Precision ii) Hysterisis   iii) Sensitivity **(06 Marks)**
      c.   Explain linear variable differential transducer (LVDT) with neat sketch. **(06 Marks)**

OR

8   a. Explain with a block diagram telemetering receiving system. **(04 Marks)**
      b.   Explain with a neat sketch cathode ray oscilloscope. **(08 Marks)**
      c.   What are X-Y plotters? With block diagram explain working of X-Y plotters. **(08 Marks)**

Module 5

9   a. Explain working of proving ring with neat sketch. **(06 Marks)** -
      b.   With a neat sketch, explain the working of prong brake dynamometer. **(08 Marks)**
      c.   Discuss the working of McLeod gauge. **(08 Marks)**

OR

10 a. State and explain the laws of thermocouple. **(06 Marks)**
      b.   Discuss the construction and working of an optical pyrometer. **(10 Marks)**
      c.   Describe the steps to be taken for the preparation of specimen and mounting and strain gauges. **(04 Marks)**