USN ☐☐☐☐☐☐☐☐☐☐   **17AE36**

Third Semester B.E. Degree Examination, Dec.2018/Jan.2019
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.   What is Metrology? State and explain the objectives of metrology.   **(06 Marks)**
    b.   Describe with neat sketches :
         i) Imperial standard yard   ii) International prototype meter.   **(08 Marks)**
    c.   Three 100mm end bars are measured on a level comparator by first wringing them together
         and comparing with a 300 mm bar. The 300 mm bar has a known error of + 40 μm and the
         three bars together measure 64μm less than the 300 mm bar. Bar A is 18μm longer than bar
         B and 23μm longer than bar C. Find the actual length of each bar.   **(06 Marks)**

OR

2   a.   Explain the wringing phenomena of slip gauges.   **(06 Marks)**
    b.   Write a brief note on the manufacture of slip gauges.   **(06 Marks)**
    c.   The slip gauge set of M38 consists of the following :

Range (mm)	Steps (mm)	Pieces
1.005	-	1
1.01 – 1.09	0.01	9
1.1 – 1.9	.01	9
1.0 – 9.0	1.0	9
10.0 – 100.0	10.0	10

List the slip gauges to be wrung together to produce the following dimensions.
         i) 29.875mm   ii) 15.09mm   iii) 101.345.   **(08 Marks)**

Module-2

3   a.   Define the following : i) Nominal size   ii) Basic size   iii) Actual size
         iv) Zero line   v) Allowance   vi) Fit.   **(06 Marks)**
    b.   Explain unilateral and bilateral tolerance, with an example.   **(08 Marks)**
    c.   Discuss hole basis and shaft basis system.   **(06 Marks)**

OR

4   a.   What are the different types of materials used for gauges?   **(08 Marks)**
    b.   Explain in detail the three methods of gauge maker's tolerance.   **(12 Marks)**

Module-3

5   a.   What are the required characteristics of comparators?   **(06 Marks)**
    b.   Explain the principle of optical comparator.   **(06 Marks)**
    c.   Explain with a sketch, Zeiss ultra – optimeter.   **(04 Marks)**
    d.   List the advantages and disadvantages of optical comparators.   **(04 Marks)**

OR

6 a. What are the various types of errors on screw heads and explain the reasons for the same? (06 Marks)

   b. Describe the 3 – wire method of measuring the effective diameter of threads. (08 Marks)

   c. Explain with sketch the principle of microptic autocollimator. (06 Marks)

Module-4

7 a. Describe the three stages of measurement, with a suitable example. (06 Marks)

   b. Define and state the significance of the following terms in measurement :
   i) Accuracy   ii) Precision   iii) Sensitivity   iv) Repeatability   v) Loading effect
   vi) Hysteresis. (06 Marks)

   c. Briefly explain systematic and random errors. (08 Marks)

OR

8 a. How do you classify first stage devices? Give examples for each. (06 Marks)

   b. Discuss the various mechanical type of pressure sensitive elements. (06 Marks)

   c. Explain with sketches, capacitive transducers of
   i) Changing area   ii) Changing distance. (08 Marks)

Module-5

9 a. Explain the three types of dynamometers. (06 Marks)

   b. Write a note on hydraulic dynamometer. What are the advantages of hydraulic dynamometers over mechanical brakes? (08 Marks)

   c. Describe with a neat sketch, McLeod vaccum guage. (06 Marks)

OR

10 a. What is a Thermocouple? Explain the principle on which it works. (06 Marks)

   b. Explain with a sketch, bonded type resistance strain gauge. (06 Marks)

   c. Explain the treatment regarding preparation and mounting of strain gauges. Also explain the problems associated with strain gauge installations. (08 Marks)

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