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17ME46B/17MEB406

Fourth Semester B.E. Degree Examination, Jan./Feb. 2021
Mechanical Measurements 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. Define Metrology. What are the objectives of metrology from industrial point of view? **(06Marks)**
    b. Explain International Prototype Meter with sketch. **(08 Marks)**
    c. Three 100mm end bars are measured on a level comparator by first wringing them together and comparing with 300mm bar. There was error of 0.03mm and three bars together have total error of 0.064mm less than the standard bar. Bar A is 0.02mm longer than bar B and 0.025mm longer than bar C. Determine the actual dimensions of all end bars. **(06 Marks)**

OR

2   a. Using M112 set of slip gauges, build the following dimensions :
        (i) 49.3115   (ii) 68.208   (iii) 52.496 **(06 Marks)**
    b. Sketch and explain Sine bar. **(06 Marks)**
    c. Explain the principle of Auto-Collimeter with a neat sketch and list the advantages of wave length standards. **(08 Marks)**

Module-2

3   a. Explain the Hole basis and Shaft basis system. **(06 Marks)**
    b. Determine the type of fit after deciding the fundamental deviations and tolerances in the following:
        Fit $\phi\, 70 H_9 e_7$, Diameter step 50 to 80mm, FD for 'e' shaft $= -11 D^{0.41}$, $IT_7 = 16i$, $IT_9 = 40i$,
        $i(\text{microns}) = 0.45 \sqrt[3]{D} + 0.001D$ **(10 Marks)**
    c. Explain Taylor's principle of Gauge design. **(04 Marks)**

OR

4   a. What is a comparator? What are the basic requirements of comparators? **(06 Marks)**
    b. Describe with a neat sketch the working of LVDT. Mention its advantages and disadvantages. **(08 Marks)**
    c. Sketch and explain Solex comparators. **(06 Marks)**

Module-3

5   a. With the set up, explain how Effective diameter of a screw thread is measured using 3 wire method. **(08 Marks)**
    b. Define the following terminology of screw threads:
        (i) Angle of the thread,   (ii) Pitch,   (iii) Major-diameter,   (iv) Minor diameter. **(04 Marks)**
    c. Explain with a neat sketch of Tool Maker's microscope. What are its applications? **(08 Marks)**

OR

6   a. Explain with a neat sketch, Gear tooth thickness measurement using Gear tooth vernier caliper. **(10 Marks)**
    b. Explain construction and working of coordinate measuring machine. Write its applications. **(10 Marks)**

Module-4

7   a.   Explain the generalized measurement system with block diagram with an example. **(10 Marks)**
    b.   Briefly explain the following terms:
         (i) Hysteresis   (ii) Accuracy   (iii) Precision   (iv) Threshold   (v) Repeatability
         (10 Marks)

OR

8   a.   What are the transducers? List the advantages and disadvantages of a Mechanical transducer. **(06 Marks)**
    b.   Explain Ballast circuit with sketch. **(06 Marks)**
    c.   Explain the working principle of CRO and give its applications. **(08 Marks)**

Module-5

9   a.   Explain with a neat sketch the Analytical balance. **(10 Marks)**
    b.   Explain with a neat sketch Prony brake dynamometer. What are its limitations? **(10 Marks)**

OR

10 a.   State and explain laws of thermocouple. **(04 Marks)**
    b.   What is Pyrometer? Explain with a neat sketch working principle of Optical Pyrometer. **(10 Marks)**
    c.   What are the steps to be taken in the preparation of the specimen and mounting of strain gauges? **(06 Marks)**

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