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18ME36B/18MEB306

Third Semester B.E. Degree Examination, Feb./Mar. 2022
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 and explain its significance in engineering.   **(06 Marks)**
    b. Explain with neat sketches:
       i)   Imperial standard yard
       ii) International prototype meter.   **(10 Marks)**
    c. State the differences between line standards and end standards.   **(04 Marks)**

OR

2   a. Describe with a neat sketch wringing phenomena of slip gauges.   **(06 Marks)**
    b. Build up a length of 35.4875 using M112 set, using two protector slips of 2.5mm each.
                                                                                          (08 Marks)
    c. Explain the principle of autocollimator with a neat diagram.   **(06 Marks)**

Module-2

3   a. Briefly explain limits, fits and tolerances.   **(06 Marks)**
    b. Differentiate between :
       i)   Interchangeability
       ii) Selective assembly   **(04 Marks)**
    c. Determine the tolerances on the hole and the shaft for a precision running fit designated by
       50H796. Given:
       i)   50mm lies between 30-50mm
       ii) $i = 0.45 \sqrt[3]{D} + 0.001D$
       iii) Fundamental deviation for shaft = $-2.5D^{0.34}$.
       iv) $IT7 = 16i$ and $IT6 = 10i$
       State the actual maximum and minimum sizes of the hole and shaft and maximum and
       minimum clearance.   **(10 Marks)**

OR

4   a. Explain with a neat sketch the construction and working of Johnson Mikrokator comparator.
                                                                                          (10 Marks)
    b. Explain with a neat sketch the construction and working of solex pneumatic comparator.
                                                                                          (10 Marks)

Module-3

5   a. Derive an expression for the effective diameter of a screw thread by 3-wire method.
                                                                                          (10 Marks)
    b. Explain with a neat sketch the measurement of major diameter and minor diameter of an
       Internal thread.   **(10 Marks)**

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<div align="center">OR</div>

6 a. With a neat sketch, explain the construction of a tool maker's microscope. What are its applications? **(10 Marks)**

b. Describe a gear tooth vernier calipers and show how this is used for checking gears. **(10 Marks)**

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Module-4

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7 a. Describe the 3 stages of measurements with an example. **(10 Marks)**

b. Elaborate the significance of the following terms used with reference to measurement:
i) Accuracy   ii) Precision   iii) Repeatability   iv) Hysteresis   v) Threshold **(10 Marks)**

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8 a. Distinguish between:
i)   Primary and secondary transducer
ii)   Active and passive transducer. **(06 Marks)**

b. With a block diagram explain telemetry. **(06 Marks)**

c. With a neat sketch, explain the construction and parts of a cathode ray oscilloscope. **(08 Marks)**

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Module-5

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9 a. Sketch and explain the analytical balance (Equal arm balance). **(10 Marks)**

b. Explain how the torque is measured using prony brake dynamometer. **(10 Marks)**

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10 a. Explain the construction and working of optical pyrometer. **(10 Marks)**

b. What is thermocouple? State the laws of thermocouple. **(10 Marks)**

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