



End Term (Odd) Semester Examination November/December 2025

Roll No.....

Name of the Course and semester: **B.Tech. ME & Vth**

Name of the Paper: **Mechanical Measurement and Metrology**

Paper Code: **TME 510**

Time: 3-hours

Maximum Marks: 100

Note:

- (i) All the questions are compulsory.
- (ii) Answer any two sub questions from a, b, and c in each main question.
- (iii) Total marks for each question are 20 (twenty).
- (iv) Each sub-question carries 10 marks.

Q1. (2×10 = 20 Marks)

- a. Explain in detail the different types of length standards used internationally. How is the wavelength standard superior to the prototype meter and imperial yard? (CO5 and CO1)
- b. Differentiate between line standards and end standards with suitable examples. Discuss their advantages and limitations. (CO5 and CO1)
- c. During calibration of an end bar of 250 mm, an optical comparator shows a deviation of +0.008 mm. Determine the actual length and percentage error. (CO5 and CO1)

Q2. (2×10 = 20 Marks)

- a. Define tolerance and explain its importance in manufacturing. Discuss the principle of interchangeability and selective assembly. (CO2 and CO5)
- b. Explain with examples the different types of fits and their standard designations (e.g., H7/g6). (CO2 and CO5)
- c. For a shaft of nominal size 40 mm, the tolerance on hole is H7 (+0.025/0.000 mm) and on shaft is f7 (-0.025/-0.050 mm). Find the type of fit and maximum and minimum clearances. (CO2 and CO5)

Q3. (2×10 = 20 Marks)

- a. Explain the working principle of mechanical comparators. Describe the construction and operation of Johnson Mikrokator and Sigma Comparator. (CO3 and CO5)
- b. Compare mechanical, optical, electrical, and pneumatic comparators in terms of sensitivity, accuracy, and applications. (CO3 and CO5)
- c. In a three-wire method, the measured diameter over wires is 25.683 mm, wire diameter is 0.5 mm, and pitch is 1.5 mm. Calculate the effective diameter of the screw thread. (CO3 and CO5)

Q4. (2×10 = 20 Marks)

- a. Explain the elements of a generalized measurement system with a block diagram. (CO4 and CO5)
- b. Define and differentiate between accuracy, precision, repeatability, sensitivity, and linearity with examples. (CO4 and CO5)
- c. Write short notes on form and finish measurement techniques. Explain how surface roughness is measured. (CO4 and CO5)

Q5. (2×10 = 20 Marks)

- a. Explain the working principle of a proving ring used for force measurement and compare it with an analytical balance. (CO5 and CO6)
- b. Describe the construction and working of a Prony brake dynamometer for torque measurement. (CO5 and CO6)
- c. Compare the Bridgman, McLeod, and Pirani gauges used for pressure measurement. Mention their ranges and limitations. (CO5 and CO6)