

CBCS SCHEME

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18AU35

Third Semester B.E. Degree Examination, Dec.2023/Jan.2024 Mechanical 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. Define the term 'Metrology'. Explain the generalized measurement system with a block diagram. (10 Marks)
b. Classify the different types of errors. (10 Marks)

OR

- 2 a. What is wave length standard? List the advantages and disadvantages of wavelength standard over material length standard. (10 Marks)
b. Four length bars A, B, C and 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 D 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. (10 Marks)

Module-2

- 3 a. Illustrate the classification of comparators, with a neat sketch explain the working principle of dial indicator. (10 Marks)
b. Describe interferometry. Explain the principle of optical flats. (10 Marks)

OR

- 4 a. Illustrate the working principle of clinometer. (10 Marks)
b. With a neat sketch, explain the working principle of LVDT. (10 Marks)

Module-3

- 5 a. Write a short note on electronic transducers. (10 Marks)
b. Explain the principle of capacitive transducer and list the advantages and disadvantages of capacitive transducers. (10 Marks)

OR

- 6 a. Write a short note on input circuitry in intermediate modifying devices. (10 Marks)
b. Write a short note on X-Y plotters. (10 Marks)

Module-4

- 7 a. Derive an expression for sensitivity of analytical balance. (10 Marks)
b. What is torque measurement? Describe the working principle of prony brake with a neat sketch. (10 Marks)

OR

- 8 a. Explain the concept of bridge circuit for the measurement of strain. (10 Marks)
b. Write a short note on:
i) Types of strain gauges
ii) Mounting of strain gauges. (10 Marks)

Module-5

- 9 a. Illustrate the specification of tolerances in assembly. (08 Marks)
- b. Design tolerances for the component having 25 H7/f8 fit. Given:
- i) 25mm lies between 18-30mm
 - ii) $i = 0.45 \sqrt[3]{D} + 0.001D$ micron
 - iii) Fundamental deviation for 'f' shaft = $-5.5D^{0.41}$.
 - iv) IT7 = 16i and IT8 = 25i
 - v) Fundamental deviation for 'H' hole = 0.
- Also design the 'GO' and 'NOGO' gauges for the shaft and hole and comment on the type of fit. (12 Marks)

OR

- 10 a. Write a short note on principle and materials of thermocouple. (10 Marks)
- b. Differentiate between absolute pressure and gauge pressure. Explain the working principle of Bridgeman gauge. (10 Marks)
