

# CBCS SCHEME

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## Third Semester B.E. Degree Examination, July/August 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. What are the objectives of metrology? (06 Marks)
- b. Explain with a neat sketch Imperial yard material standard. (06 Marks)
- c. A calibrated meter end bar has an actual length of 1000.0003mm. It is to be used in the calibration of two bars A and B each having a basic length of 500mm. When compared with a meter bar  $L_A + L_B$  was found to be shorter by 0.0002mm. In comparing A with B, it was found that A was 0.0004mm longer than B. Find the actual length of A and B. (08 Marks)

OR

- 2 a. Describe with neat sketches of wringing phenomenon of slip gauges. (05 Marks)
- b. Using M112 set of slip gauges, build the following dimensions: (09 Marks)
  - (i) 52.496
  - (ii) 49.3115
  - (iii) 58.975
- c. Explain principle and procedure of measuring unknown angle using sine bar. (06 Marks)

### Module-2

- 3 a. With neat sketches explain different types of fit. (06 Marks)
- b. State and explain Taylor's principle of gauge design. (04 Marks)
- c. Determine the tolerances on the hole and the shaft for a precision running fit designated by 50H7g6 given: (10 Marks)
  - (i) 50mm lies between 30 – 50 mm
  - (ii)  $i(\text{micron}) = 0.45 D^{1/3} + 0.001D$
  - (iii) Fundamental deviation for H hole = 0
  - (iv) Fundamental deviation for g shaft =  $-2.5D^{0.34}$
  - (v) IT7 = 16i
  - (vi) IT6 = 10i

State the actual maximum and minimum sizes of the hole and shaft and maximum and minimum clearness.

OR

- 4 a. With neat sketch, explain the working of Johnson Mikrokator. Also mention advantages and limitation of mechanical comparator. (10 Marks)
- b. With neat sketch, explain the working electrical comparator – LVDT. Also mention its advantages. (10 Marks)

### Module-3

- 5 a. Derive an expression for effective diameter measurement of a screw thread using 3-wire method. (10 Marks)
- b. With neat sketch explain tool maker's microscope. (10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

OR

- 6 a. With neat sketch, explain Gear Tooth Terminology. (08 Marks)  
b. Sketch the gear tooth vernier caliper and explain tooth thickness measurement using gear tooth vernier method. (12 Marks)

**Module-4**

- 7 a. Define : (i) Accuracy (ii) Threshold (iii) Calibration (iv) Hysteresis (v) Repeatability (vi) Sensitivity. (06 Marks)  
b. Explain generalized measurement system, with block diagram. (08 Marks)  
c. What is an Error? Classify the error. (06 Marks)

OR

- 8 a. With neat sketch explain the following :  
(i) Capacitive transducer – changing distance  
(ii) Piezoelectric transducer. (12 Marks)  
b. With a neat sketch explain the working of Cathode Ray – Oscilloscope. (08 Marks)

**Module-5**

- 9 a. Explain prony brake dynamometer with neat sketch and mention its limitations. (10 Marks)  
b. Explain with neat sketch the working of McLeod gauge. (10 Marks)

OR

- 10 a. Discuss the construction and working of an optical pyrometer. (08 Marks)  
b. State and explain the two laws of thermocouple with sketches. (06 Marks)  
c. With neat sketch explain the strain measurement using Wheatstone-Bridge Resistance meter. (06 Marks)

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