

# CBCS SCHEME

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18AE36

## Third Semester B.E. Degree Examination, June/July 2024 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 the terms Metrology and Measurement. State and explain the objectives of Metrology. (10 Marks)
- b. With a neat sketch, explain :  
i) Imperial standard yard ii) International Prototype meter. (10 Marks)

### OR

- 2 a. Briefly explain the characteristics, advantages and disadvantages of Line standard, End standard and Wave length standards. (10 Marks)
- b. i) Three 100mm end bars are measured on a level comparator by first wringing them together and comparing with a 300mm bar. The 300mm bar has a known error of +40 $\mu$ m and the three bars together measure 64 $\mu$ m less than the 300mm bar. Bar A is 18 $\mu$ m longer than bar B and 23 $\mu$ m longer than bar C. Find the actual length of each bar. (06 Marks)
- ii) Using M112 set of slip gauges build the following dimensions :  
i) 49.3115 ii) 68.208.

Range (mm)	Steps (mm)	Pieces
1.001 to 1.009	0.001	09
1.01 to 1.49	0.01	49
0.5 to 24.5	0.50	49
25,50,75,100	25	04
1.0005	-	01

(04 Marks)

### Module-2

- 3 a. i) Differentiate between Unilateral and Bilateral tolerances. Why Unilateral tolerance is preferred over bilateral tolerance. (06 Marks)
- ii) Write a note on : i) Compound Tolerances ii) Interchangeability. (04 Marks)
- b. With a neat sketch, explain the various types of Fits. (10 Marks)

### OR

- 4 a. i) Discuss the hole based and shaft based system of fits. Which is preferred and why? (06 Marks)
- ii) What are Limit gauges? Explain any two types of plain plug gauges. (04 Marks)
- b. Determine the tolerance on the hole and the shaft for a precision machine fit designated by 50H<sub>7</sub>g<sub>6</sub>. Given i) 50mm lies between 30 – 50mm.  
ii)  $i(\text{microns}) = 0.45 (D)^{1/4} + 0.001D$  iii) Fundamental deviation for 'H' hole = 0.  
iv) Fundamental deviation for shaft 'g' =  $-2.5D^{0.34}$ .  
v)  $IT_7 = 16 i$  vi)  $IT_6 = 10 i$ .
- State the actual max. and min. sizes of the hole and shaft and max. & min. clearances. (10 Marks)

**Module-3**

- 5 a. With a neat sketch, describe the Construction and working of Sigma Comparator. (10 Marks)  
 b. How do you find the effective diameter of a screw thread using 2 – wire method? (10 Marks)

**OR**

- 6 a. i) Describe with a neat sketch Construction and working of LVDT. (06 Marks)  
 ii) List the advantages and disadvantages of Optical comparator. (04 Marks)  
 b. i) With a sketch, explain the method of measuring Taper angles using Sine centre. (06 Marks)  
 ii) Give the combination of angle gauges to obtain the following angle, also sketch the arrangement of gauges :  $37^{\circ} 16' 42''$ . (04 Marks)

**Module-4**

- 7 a. Explain with an example the various stages of a generalized Measurement system. (10 Marks)  
 b. Define and state the significance of following terms in measurement :  
 i) Accuracy ii) Precision iii) Sensitivity iv) Repeatability  
 v) Loading effect. (10 Marks)

**OR**

- 8 a. Define Error. Give the detailed classification of errors in Measurement and also state the factors responsible for the above errors. (10 Marks)  
 b. i) Explain briefly the various types of Mechanical Transducer elements. (05 Marks)  
 ii) With a sketch, explain the working principle of an electronic transducer. (05 Marks)

**Module-5**

- 9 a. What is Dynamometer? With a sketch, explain the working principle of hydraulic dynamometer. (10 Marks)  
 b. What is Thermocouple? Explain the laws of Thermocouple. (10 Marks)

**OR**

- 10 a. With a neat sketch, explain the measurement of low pressure by McLeod gauge. (10 Marks)  
 b. Explain with a neat sketch, any one mechanical type strain gauge, also list their advantages and disadvantages. (10 Marks)

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