

CBGS SCHEME

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18AE36

Third Semester B.E. Degree Examination, Aug./Sept.2020 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. Explain the NPL method of deriving end standards from line standards. (10 Marks)
b. Describe with a neat sketch, material length standard. List the disadvantages of material length standard. (10 Marks)

OR

- 2 a. Discuss briefly Indian standards on slip gauges. (05 Marks)
b. Describe the steps in wringing of slip gauges. (05 Marks)
c. The slip gauge set of M-112 consists of the following :

Range (mm)	Steps (mm)	Pieces
1.0005	-	1
1.001 – 1.009	0.001	9
1.01 – 1.49	0.01	49
0.5 – 24.5	0.5	49
25.0 – 100.0	25.0	4

List the slip gauges to be wrong together to produce the following dimensions :

- i) 49.3115mm ii) 78.3665mm iii) 52.496mm. (10 Marks)

Module-2

- 3 a. Define the following terms :
i) Limits ii) Compound tolerances iii) Accumulation of tolerances. (06 Marks)
b. Discuss 'Hole based' and 'Shaft based' system of fits. Which is preferred? Why? (06 Marks)
c. Determine the type of fit after deciding the fundamental deviations and tolerances in the following : Fit $\phi 70 H_8 e_7$, Diameter step (50 – 80) , Fundamental deviation for e shaft = $-11 D^{0.41}$, IT7 = $16^{\circ}C$, IT9 = $40i$, $i = 0.45 \sqrt[3]{D} + 0.001D$. (08 Marks)

OR

- 4 a. What are Limit gauges? Sketch and explain any two types of plain plug gauges. (08 Marks)
b. Construct the "General" type "GO" and "NO GO" gauges for the component having $25H_7 / f_8$ fit. Given the following with usual notations :
i) $i(\mu) = 0.45 \sqrt[3]{D} + 0.001D$ ii) Upper deviation for f shaft = $-5.5D^{0.41}$.
iii) 25mm falls in the diameter step of 18 – 30mm. Take wear allowance as 10% of the gauge tolerance. Also determine i) Type of fit ii) Allowance for the above fit. (12 Marks)

Module-3

- 5 a. With a neat sketch describe the construction and working of sigma comparator. (05 Marks)
b. With a neat sketch, explain LVDT and state its advantages. (05 Marks)
c. Explain with sketch, about the measurement of known and unknown angles of components using sine bar. (10 Marks)

OR

- 6 a. Define the following terms with respect to screw thread : i) Axis of the thread
ii) Crest of the thread iii) Root of the thread iv) Pitch. (08 Marks)
- b. Sketch the combination of angle gauges to obtain the following angles.
i) $33^{\circ} 16' 42''$ ii) $102^{\circ} 8' 42''$. (08 Marks)
- c. Discuss the 2 wire method of measuring effective diameter of threads. (04 Marks)

Module-4

- 7 a. What are the fundamental methods of measurement? Explain with examples. (05 Marks)
- b. Discuss with block diagram, generalized measurement system with example for each stage elements. (05 Marks)
- c. Explain with sketches : i) Hysteresis ii) Threshold iii) Sensitivity
iv) Calibration v) Repeatability. (10 Marks)

OR

- 8 a. Define an Error. How are errors classified? Relate the reasons for each type of error during measurement. (10 Marks)
- b. Explain with neat sketch, the construction and working of an electronic transducer element. (05 Marks)
- c. With a neat sketch, explain Piezoelectric transducer. (05 Marks)

Module-5

- 9 a. Explain with neat sketch, Analytical balance. (05 Marks)
- b. Explain Hydraulic dynamometer, with neat sketch. (05 Marks)
- c. What do you mean by low pressure measurement? Explain the working of McLeod gauge (10 Marks)

OR

- 10 a. Describe the principle of Thermocouples and illustrate the application of thermocouples. (05 Marks)
- b. What are the different methods of Strain measurement? Explain Mechanical strain gauge. (05 Marks)
- c. Define gauge factor of a strain gauge and explain with a neat sketch, measurement of strain using Wheatstone bridge circuit. (10 Marks)
