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18AE36

Third Semester B.E. Degree Examination, Jan./Feb. 2023 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. What is Metrology? State and explain the objectives of metrology. (06 Marks)
- b. Describe with a neat sketch. International prototype meter. (06 Marks)
- c. Using M112 set of slip gauges, build the following dimensions (08 Marks)
 - i) 49.3115 ii) 68.208 iii) 52.496.

OR

- 2 a. Describe the phenomena of wringing of slip gauges with a neat sketch. (06 Marks)
- b. Differentiate between line standard and end standard with example. (06 Marks)
- c. Four length P, Q, R, S of approximately 250mm each are to be calibrated with standard calibrated meter bar which is actually 0.0008mm less than a meter. It's also found that, bar is 0.0002mm longer than bar P, bar R is 0.0004mm longer than bar P and bar S is 0.0001mm shorter than bar P. The length of all four bars put together is 0.0003mm longer than the calibrated standard meter. Determine the actual dimension of each bar. (08 Marks)

Module-2

- 3 a. Discuss hole basis and shaft basis system. (06 Marks)
- b. With suitable example, explain bilateral and unilateral tolerance. (06 Marks)
- c. Define fit and explain the following showing the designation of each (08 Marks)
 - i) Clearance fit ii) Interference fit.

OR

- 4 a. Sketch and explain plug and snap gauges. (08 Marks)
- b. Determine the tolerance on the hole and the shaft for a precision running fit designated by 50H₇g₆. Given : (08 Marks)
 - i) 50mm lies between 30 – 50mm
 - ii) $i(\mu) = 0.45 (D)^{1/3} + 0.001D$
 - iii) Fundamental Deviation of Hole 'H' = 0
 - iv) Fundamental Deviation of shaft 'g' = $-2.5D^{0.34}$
 - v) IT7 = 16i
 - vi) IT6 = 10i

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

- c. Explain Taylor's principles for design of limit gauge. (04 Marks)

Module-3

- 5 a. With a neat sketch, explain the principle of working of sine bar and sine centre. (08 Marks)
- b. How do you find effective diameter of a screw thread using two wire methods. (08 Marks)
- c. Explain need for a comparator. (04 Marks)

OR

- 6 a. Explain with a neat sketch of working of a "Solex pneumatic comparators". (08 Marks)
b. Explain the principle of optical comparator. (06 Marks)
c. Explain with a sketch "zeiss ultra optimizer". (06 Marks)

Module-4

- 7 a. What is measurement? What are the requirements of an ideal measurement system? (08 Marks)
b. Define Error. Give the detailed classification of errors. (06 Marks)
c. With neat sketch, explain piezo electric transducer. (06 Marks)

OR

- 8 a. Define the following terms in measurement
i) Accuracy ii) Precision iii) Sensitivity iv) Repeatability
v) Loading effect vi) Hysteresis. (06 Marks)
b. How do you classify first stage devices? Give example for each. (06 Marks)
c. Explain with sketches, capacity transducer of i) changing area ii) changing distance. (08 Marks)

Module-5

- 9 a. Explain with a neat sketch of the analytical balance. (06 Marks)
b. Describe with a neat sketch, McLeod vacuum gauge. (06 Marks)
c. Explain the construction and working of optical pyrometer with neat sketch. (08 Marks)

OR

- 10 a. Write a note on Hydraulic dynamometer. What are the advantages of hydraulic dynamometer over mechanical brakes? (06 Marks)
b. With a neat sketch, explain electrical resistance thermometer. (06 Marks)
c. With a neat diagram and explain a simple Resistance bridge arrangement for strain measurement. (08 Marks)
