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15ME46B/MEB406

Fourth Semester B.E. Degree Examination, Aug./Sept.2020 Mechanical Measurements and Metrology

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Define Metrology and state any two of its objectives. (04 Marks)
- b. Discuss any two characteristics of line and end standards. (04 Marks)
- c. Three 200mm gauges to be calibrated are measured on a level comparator by wringing them together and then comparing them with a 600mm gauge. The 600mm gauge has an actual length 600.0025mm and the three gauges together have a combined length of 600.0035mm. When the three gauges are inter-compared. It is found that gauge A is longer than gauge B by 0.0020mm but shorter than gauge C by 0.001mm. Determine the length of each gauge. (08 Marks)

OR

- 2 a. What is meant by wringing of slip gauges? (02 Marks)
- b. Explain how conical work pieces are inspected on a Sine centre. (08 Marks)
- c. What are angle gauges? Select the sizes of angle gauges required to build $57^{\circ} 34' 9''$. (06 Marks)

Module-2

- 3 a. What do you mean by Interchangeable manufacture? (02 Marks)
- b. It is possible to drill a 25mm nominal hole to an accuracy of 25 ± 0.02 mm using standard drill and drilling machine available. A shaft is to be machined to obtain a clearance fit in the above hole such that allowance should be 0.01mm and maximum clearance should not be more than 0.08mm. What should be the Tolerance on the shaft? (06 Marks)
- c. State and explain Taylor's principle of gauge design. (08 Marks)

OR

- 4 a. Name any two functional requirements of a comparator. (02 Marks)
- b. Sketch and explain dial Indicator. (06 Marks)
- c. Explain with a sketch, the working of a SOLEX Pneumatic comparator. (08 Marks)

Module-3

- 5 a. What do you mean by Best size wire? (02 Marks)
- b. Derive an expression for effective diameter of screw thread by Two – wire method. (08 Marks)
- c. Sketch and explain Gear roll tester for composite error. (06 Marks)

OR

- 6 a. State any two advantages of laser. (02 Marks)
- b. State any four applications of CMM. (04 Marks)
- c. Give the constructional details and working principle of CMM. (10 Marks)

Module-4

- 7 a. Distinguish between Accuracy and Precision. (02 Marks)
b. Explain with necessary block diagram the elements of generalized measurement system. (08 Marks)
c. Explain the classification of errors in measurement. (06 Marks)

OR

- 8 a. State any two inherent problems of mechanical system. (02 Marks)
b. Explain briefly the ballast circuit. (06 Marks)
c. Sketch and explain Cathode ray oscilloscope. (08 Marks)

Module-5

- 9 a. What is the fundamental difference between direct and indirect method of force measurement? (02 Marks)
b. With a neat sketch, explain the working principle of analytical balance. (07 Marks)
c. Explain the principle of working of McLeod gauge, with a neat sketch. (07 Marks)

OR

- 10 a. Define the term gauge factor. (02 Marks)
b. Explain with a neat sketch, measurement of strain using Wheat Stone Bridge circuit. (08 Marks)
c. State and explain three laws of thermocouple. (06 Marks)

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