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# P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Fourth Semester, B.E. - Mechanical Engineering

Semester End Examination; May/June - 2019

**Mechanical Measurements and Metrology**

Time: 3 hrs

Max. Marks: 100

**Note:** i) Answer **FIVE** full questions, selecting **ONE** full question from each unit.

ii) Any missing data may be suitably assumed.

## UNIT - I

- 1 a. What is Metrology? State its objectives. 6
- b. Define the following : 9
- i) Imperial standard yard      ii) Line standard      iii) End standard
- c. Describe some sources of errors in precision measurement. 5
- 2 a. With the help of neat sketches, describe the method of using of slip gauges. 10
- b. Explain the following terms in mechanical measurements : 10
- i) Calibration      ii) Sensitivity
- iii) Precision      iv) Accuracy

## UNIT - II

- 3 a. Explain Unilateral and Bilateral tolerances with sketches. 10
- b. Define the following with sketches : 10
- i) Clearance fit      ii) Interference fit
- iii) Transition fit      iv) Fundamental deviation
- 4 a. A fit is designated by  $60H_8/f_7$ . Dimension 60 mm falls in the range of 50 to 80 mm fundamental deviation for  $f$  shaft is  $-5.5D^{0.41}$ ,  $IT_7 = 16i$  and  $IT_8 = 25i$ . Tolerance unit,  $i = 0.48\sqrt[3]{D} + 0.001D$  (Microns). Sketch the fit and show these upon the actual dimensions of hole and shaft. 10
- b. Explain Taylor's principle for the design of limit gauges. 5
- c. Explain with sketch the following : 5
- i) Ring gauges      ii) Snap gauges

## UNIT - III

- 5 a. Sketch and explain the following comparators : 12
- i) Sigma comparator      ii) Zeiss ultra optimizer
- b. With a neat figure, explain the principle of sine bar. 8
- 6 a. What do you mean by best wire size and derive for the same. 8
- b. Explain with sketches the measurement of effective diameter by two wire method and three wire methods. 12

**UNIT - IV**

- 7 a. What is Transducer? Classify transducers with examples. 8
- b. What are the advantages of electrical transducers? 6
- c. Explain with a circuit simple current sensitive circuit. 6
- 8 a. Explain with a neat sketch telemetry transmitting and receiving system. 8
- b. Explain with a neat sketch construction and working of Cathode Ray Oscilloscope. 8
- c. Write a note on X-Y plotters. 4

**UNIT - V**

- 9 a. Write a note on Wheatstone bridge circuit with the circuit diagram. 6
- b. Explain with a neat sketch, construction and working of Hydraulic Dynamometer. 8
- c. Explain with a neat sketch, construction and working of Bridgeman gauge. 6
- 10 a. Write a note on;
- i) Seebeck effect 6
- ii) Peltier effect
- iii) Thomson effect
- b. What is Thermo couple? Explain the laws of thermo couple. 8
- c. Explain with a neat sketch, construction and working of McLeod gauge. 6

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