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18IM35

## Third Semester B.E. Degree Examination, Jan./Feb. 2021 Mechanical 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 term 'Metrology'. List some of the objectives of metrology. (07 Marks)
- b. Describe with a neat sketch the International prototype metre. (07 Marks)
- c. Three 100mm end bars are measured on a level comparator by first wringing them together and comparing with a 300mm bar. There was an error of 0.03mm and three bars together have total error of 0.064mm less than the standard bar. Bar A is 0.02mm longer than bar B and 0.025mm longer than bar C. Determine the actual dimensions of all the end bars. (06 Marks)

**OR**

- 2 a. Discuss the different types of errors obtained during measurement. (10 Marks)
- b. Explain the wringing phenomenon of slip gauges with sketches. (06 Marks)
- c. List some of the advantages of wavelength standards. (04 Marks)

### Module-2

- 3 a. Explain the different types of fits with suitable sketches. (09 Marks)
- b. Determine the dimensions of a hole and shaft assembly designated as 100H<sub>8</sub>e<sub>9</sub> fit given:  
100mm lies in the diameter step of 80 and 120mm.  
 $i = 0.45\sqrt[3]{D} + 0.001D$  (D value in mm, i value in microns)  
IT8 = 25i  
IT9 = 40i  
Fundamental deviation of 'e' shaft is given by  $-5.5D^{0.41}$  in microns. (07 Marks)
- c. Explain briefly Taylor's principle on limit gauges. (04 Marks)

**OR**

- 4 a. Discuss the concept of selective assembly and Interchangeability as applied to manufacturing industries. (10 Marks)
- b. Distinguish between the following:  
i) Hole Basis system and shaft Basis system.  
ii) Geometric tolerances and positional tolerances. (10 Marks)

### Module-3

- 5 a. Explain the working principle of Johansson's Mikrokator. (08 Marks)
- b. Explain with a suitable diagram the use of sine bar for checking angles. (07 Marks)
- c. Discuss the principle of Interferometry. (05 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.

**OR**

- 6 a. Describe the three wire method for effective diameter measurement. (07 Marks)  
b. Explain with a neat sketch, the construction of a Tool Maker's microscope. (07 Marks)  
c. Explain with a neat sketch the use of Gear Tooth Vernier Calipers for the measurement of chordal thickness of a spur gear. (06 Marks)

**Module-4**

- 7 a. Describe the construction of Cathode Ray oscilloscope with a suitable diagram. (10 Marks)  
b. Write a brief note on the classification of transducers. (06 Marks)  
c. Distinguish between the active transducer and passive transducer. (04 Marks)

**OR**

- 8 a. Describe with a block diagram, the working principle of XY plotter. (08 Marks)  
b. Write a brief note on ballast circuit. (06 Marks)  
c. Explain the principle of Piezo-electric transducer. (06 Marks)

**Module-5**

- 9 a. Describe the working principle of proving ring. (07 Marks)  
b. Define Vacuum. Explain with a neat sketch McLeod gauge. (07 Marks)  
c. Define a thermocouple. State and explain the laws of thermocouple. (06 Marks)

**OR**

- 10 a. Write a brief note on resistance thermometer. (06 Marks)  
b. Describe the working principle of analytical balance. (07 Marks)  
c. Explain briefly the method of measuring strain using Wheatstone bridge arrangement. (07 Marks)

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