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## Third Semester B.E. Degree Examination, Dec.2019/Jan.2020 Mechanical Measurement

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 the objectives of metrology. (06 Marks)
- b. Explain the wringing phenomenon of slip gauge. (06 Marks)
- c. With a neat sketch, explain international prototype meter. (08 Marks)

**OR**

- 2 a. Four length bars A, B, C, D of approximately 250mm each are to be calibrated with standard calibrated meter bar which is actually 0.0008mm less than a meter. It is also found that, bar B is 0.0002mm longer than bar A, bar C is 0.0004mm longer than bar A and bar D is 0.0001mm shorter than the calibrated bar A. The length of all four bar put together is 0.0003mm longer than the calibrated standard meter. Determine the actual dimension of each bar. (10 Marks)
- b. Using NPL method, derive equation for calibrating end standards from line standard. (10 Marks)

### Module-2

- 3 a. Write a short note on :
  - i) Interchangeability
  - ii) Selective assembly. (10 Marks)
- b. The hole and shafting system has the following dimension  $50H_8/C_8$  with diameter step 50 to 80mm. the multipliers for grade 8 is 25. The fundamental deviation of shaft C and  $D > 40\text{mm}$  is given by  $FD = -(95 + 0.8D)$  in microns. Sketch the fit and show that these upon the actual dimensions of hole and shaft. Also calculate minimum and maximum allowances. (10 Marks)

**OR**

- 4 a. Determine the type of fit after deciding the fundamental deviation and tolerances in the following fit  $\phi 90H_8/e_9$ . Given the fundamental deviation for 'e' shaft =  $-11D^{0.41}$  microns  
Tolerance for  $IT_8 = 25i$  and  $IT_9 = 40i$  with diameter step 80mm to 100mm and  $i = 0.45 \sqrt[3]{D} + 0.001D$  as the tolerance unit. (10 Marks)
- b. Describe with a neat sketch construction and working of LVDT. (10 Marks)

### Module-3

- 5 a. Describe the 3 wire method of measuring effective diameter of threads. (10 Marks)
- b. With a sketch, explain the construction of a tool maker's microscope. (10 Marks)

**OR**

- 6 a. Derive an expression for the Chordal tooth thickness of gear. (10 Marks)
- b. Explain with sketch the construction and working of an electric transducer. (10 Marks)

**Module-4**

- 7 a. With a block diagram, explain telemetry. (10 Marks)  
b. Describe in detail a ballast circuit. (10 Marks)

**OR**

- 8 a. What are X-Y plotters? With a block diagram explain its working. (10 Marks)  
b. With a sketch, explain the construction of a Cathode – Ray oscilloscope. (10 Marks)

**Module-5**

- 9 a. Sketch and explain the working principle of optical pyrometer. (10 Marks)  
b. Describe the steps to be taken for the preparation of specimen and mounting of strain gauges. (05 Marks)  
c. What is Thermocouple? State the laws of thermocouple. (05 Marks)

**OR**

- 10 a. With a neat sketch, describe the Pirani gauge used for pressure measurement. (10 Marks)  
b. With the help of neat sketch, explain the working of McLeod gauge with neat sketch. (10 Marks)

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