

**B. TECH.**  
**(SEM IV) THEORY EXAMINATION 2017-18**  
**MEASUREMENT AND METROLOGY**

**Time: 3 Hours****Total Marks: 70****Note: 1.** Attempt all Sections. If require any missing data; then choose suitably.

**SECTION A**

**1. Attempt all questions in brief.****2 x 7 = 14**

- a) Define Metrology.
- b) What is sensitivity?
- c) Explain function of sensors.
- d) List some of the instruments for temperature measurement.
- e) Define Zero Error.
- f) Differentiate between sensor and transducer.
- g) Define range and span. What is the difference between both?

**SECTION B**

**2. Attempt any three of the following:****7 x 3 = 21**

- a) Explain with a block diagram the generalized measurement system, showing its various stages with suitable example.
- b) Define various types of sensors and along with their applications, advantages, and limitations.
- c) Enlist some of the pressure measuring devices for low pressure. Discuss the working principle of McLeod Pressure Gauge.
- d) Define Interferometry. On what principles interferometry works? Discuss some of the applications and usage of Interferometry.
- e) What is CMM? Explain with a neat sketch its constructional features. Discuss types of CMM. Also explain its applications and advantages.

**SECTION C**

**3. Attempt any one part of the following:****7 x 1 = 7**

- a) Explain Taylor's principle of gauge design. Determine the dimensions of hole and Shaft for a fit 30H7/hg. Also determine the allowance and maximum clearance.
- b) Explain in brief:
  - i. Limits Fits and Tolerance.
  - ii. Comparators.

**4. Attempt any one part of the following:****7 x 1 = 7**

- a) Write short notes on
  - i. Johansson's Microkrator
  - ii. Accelerometer

iii. Strain rosettes.

- b) With a neat sketch explain the construction and working of optical pyrometers. Discuss its significance in measurement.

**5. Attempt any *one* part of the following:**

**7 x 1 = 7**

- a) Describe the constructional details of Autocollimator. How it is useful in finding straightness, flatness and roundness of a surface?
- b) Elaborate with neat sketch:
- Hole basis system.
  - Shaft basis system.

**6. Attempt any *one* part of the following:**

**7 x 1 = 7**

- a) Classify different types of strain gauges and their application. Explain the working of Wheatstone bridge under balanced and unbalanced conditions?
- b) Discuss in brief
- Stroboscope
  - Thermistor
  - Seismic instruments

**7. Attempt any *one* part of the following:**

**7 x 1 = 7**

- a) For a platinum resistance thermometer, the resistance at  $22^{\circ}\text{C}$  is  $130\Omega$  the resistance coefficient for temperature for wire is  $0.004\Omega/\Omega^{\circ}\text{C}$  find the resistance at  $40^{\circ}\text{C}$  and temperature at which resistance will  $8.5\Omega$ .
- b) A strain gauge is bounded to a  $0.2\text{m}$  long workpiece that has a cross sectional area of  $6\text{cm}^2$  and  $E = 210\text{GN/mm}^2$  and unstrained resistance is  $240\Omega$  and  $G.F = 2.2$ . When load is applied the resistance of this plate changes by  $0.013\Omega$ . Calculate the change in length and the force applied.