

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 3991Roll No.

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B. Tech.

(SEM. IV) THEORY EXAMINATION 2011-12

MEASUREMENT AND METROLOGY

Time : 2 Hours

Total Marks : 50

Note :—(1) Attempt *all* questions.

(2) All questions carry marks as shown against them.

1. Attempt any *four* parts :— (4×3½=14)

- (a) What is the function of a transducer ? What is the difference between active and passive transducers ? What is the advantage if the output of a transducer is an electrical signal ?
- (b) A mercury thermometer has a capillary tube of 0.25 mm diameter. If the bulb and capillary tube are made of a zero expansion material, what volume must it have if a sensitivity of 2.5 mm/°C is desired ? Assume operating temperature to be 20°C and the coefficient of volumetric expansion of mercury to be 0.181×10^{-3} per °C.
- (c) Explain the meaning of “dead time” and “dead zone” of a measuring instrument.
- (d) Explain briefly the working principle of a LVDT. How can displacement be measured with a LVDT ?

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- (e) Explain what is meant by systematic error and random error.
- (f) A thermometer has a time constant of 3.5 seconds. It is quickly taken from 0°C and immersed in a water bath at 100°C temperature. What temperature will be indicated by the thermometer after 7 seconds, if the thermometer is a first order instrument ?

2. Attempt any *two* of the following :— (2×6=12)

- (a) Describe PIRANI gauge and its working principle. What is the range of absolute pressure which can be measured with this instrument ?
- (b) Describe an optical pyrometer and explain its working.
- (c) What is a seismic instrument ? Explain how it can be used to measure amplitude and acceleration of a vibrating body.

3. Attempt any *two* parts :— (2×6=12)

- (a) What is a "Comparator" ? Describe either SIGMA Comparator or Johnson's Microkrator.
- (b) What is meant by a "hole basis" system of limits and fits ? Explain the difference between allowance and tolerance. How many kinds of fits are you familiar with ? Describe them with some typical examples.
- (c) Describe the construction and working principle of a microptic Auto-collimator.

4. Attempt any *two* parts :— (2×6=12)

- (a) How is circularity or roundness of a specimen checked accurately ? Describe at least two methods.

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- (b) What parameters are required to be checked in inspection of threads ? Draw the profile of a metric thread and specify (mark) these parameters on the profile. Explain how the flank angle can be checked.
- (c) How is quantitative evaluation of surface roughness done ? What different methods of such evaluation are used in industry ?