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B.Tech.(ME) (2011 Onwards) (Sem.-5) MECHANICAL MEASUREMENT AND METROLOGY

Subject Code: BTME-503 Paper ID: [A2130]

Time: 3 Hrs. Max. Marks: 60

INSTRUCTION TO CANDIDATES:

- SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
- 2. SECTION-B contains FIVE questions carrying FIVE marks each and students has to attempt any FOUR questions.
- 3. SECTION-C contains THREE questions carrying TEN marks each and students has to attempt any TWO questions.

SECTION-A

Q1 Answer briefly:

- a) Differentiate between primary, secondary and working standards.
- b) Explain clearly the terms: Calibration, speed of response, threshold and resolution, fidelity.
- c) Discuss in brief-systematic and random errors.
- d) Suggest methods for measuring surface roughness with brief working principle.
- e) Differentiate between bonded and unbonded type of strain gauges.
- f) Describe the working of a clinometers.
- g) State the principles of Design of Experiments.
- h) How is least count of vernier caliper determined?
- i) What is the order of pressure measured by thermal conductivity gauge?
- j) Explain the difference between optical and total radiation pyrometer.



SECTION-B

- Q2 What is sine bar? How it is used for angle measurement?
- Q3 Describe the equations for time response of a first order system when subjected to unit step input.
- Q4 A resistance wire strain gauge with a gauge factor of 2 is bonded to a steel structural member subjected to a stress of 100 MN/m². The modulus of elasticity of steel is 200 GN/m². Calculate the percentage change in the value of the gauge resistance due to applied stress.
- Q5 Describe the properties of materials used for piezoelectric transducers.
- Q6 Explain the construction and working of Mcleod gauge used for measurement of vacuum.

SECTION-C

- Q7 The following 10 observations were recorded when measuring a temperature: 41.7, 42.0, 41.8, 42.0, 42.1, 41.9, 42.0, 41.9, 42.5 and 41.8 °C. Find (i) the mean (ii) the standard deviation (iii) the probable error of one reading (iv) the probable error of mean and (v) range.
- Q8 Describe the construction, theory and working of thermocouples. Discuss the different types of compensations used.
- Q9 Write a note on the following:
 - a) Hydraulic load cell.
 - b) Absorption dynamometer.

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