

Roll No.

Total No. of Questions : 09]

[Total No. of Pages : 02

B. Tech. (Sem. - 5th)

MECHANICAL MEASUREMENT AND METROLOGY

SUBJECT CODE : ME - 307

Paper ID : [A0817]

[Note : Please fill subject code and paper ID on OMR]

Time : 03 Hours

Maximum Marks : 60

Instruction to Candidates:

- 1) Section - A is **Compulsory**.
- 2) Attempt any **Four** questions from Section - B.
- 3) Attempt any **Two** questions from Section - C.

Section - A

Q1)

(10 × 2 = 20)

- a) What is meant by calibration? Why is it done for measuring systems?
- b) Differentiate between first order and second order systems.
- c) Define error. How can errors be classified?
- d) What is the significance of gauge factor for design of strain gauges?
- e) For what purpose Proving ring is used. Write four main parts of a Proving Ring.
- f) State the principle used for measurement of internal and external threads.
- g) Classify pyrometers? On what principle the working of pyrometer is based.
- h) What is anemometer? Write its various industrial applications.
- i) What is meant by uncertainty in measurement?
- j) On the basis of which principle calibration of pressure gauges is made. Write name of the instrument and its various parts.

Section - B

(4 × 5 = 20)

- Q2)** What is generalized measurement system? Explain its various parts.
- Q3)** What is meant by Dynamic response? Explain its significance in reference to measurement systems.
- Q4)** Classify strain gauges. Explain the use and application of strain gauges in measurement. Comment on the relation between gauge factor and output response of a strain gauge.
- Q5)** Explain the significance of flow visualization. Explain various flow visualization techniques.
- Q6)** Explain working principle, constructional feature of Absorption type of dynamometer.

Section - C

(2 × 10 = 20)

- Q7)** A strain gauge of resistance 120 ohms is mounted along the axial direction of an axially loaded specimen of steel. If the percentage change in length of the rod due to loading is 3% and the corresponding change in resistivity of the strain gauge material is 0.3%, estimate the percentage change in the resistance of the strain gauge and its gauge factor. If the strain gauge is connected to a measurement device capable of determining change in resistance with an accuracy of ± 0.02 ohm what is the uncertainty in stress and strain that would result in using this resistance measurement device? (Assume Poisson's ratio = 0.3 and $E = 200\text{GPa}$).
- Q8)** Explain the working and constructional details of a torsion bar dynamometer with the help of a neat sketch.
- Q9)** (a) Explain Manometer dynamics. What are various forces which are possibly coming into consideration when manometric liquid is treated as a free body?
- (b) A U-Tube manometer is used to measure a differential air pressure with a fluid of density 900kg/m^3 . The air is at 500 kPa and 25°C . Calculate the differential pressure if the difference in the height of the fluid in the manometer is 200mm. Express in units of kPa.

