

Mechanical Measurement & Metrology
(ME-307, May. 2007)

Time: 3 Hours

Max. Marks: 60

Note: Question No. 1 is compulsory. Attempt any four questions from section B and two questions from section C.

Section-A

1. (a) What is the need of measuring instruments? Give classification.
(b) Explain clearly the terms: Calibration, Speed of response, threshold and resolution, fidelity.
(c) Discuss in brief systematic and random errors. What are the sources of errors?
(d) What are the various methods to measure angular motion?
(e) Differentiate between bonded and unbonded type of strain gauges. Which one out of these two is finding wide industrial application?
(f) Draw a neat sketch of a McLeod gauge for the measurement of vacuum.
(g) Draw a neat sketch of bimetallic thermometers and explain its working principle.
(h) What do you mean by a load cell? Mention the different types of load cells used.
(i) Suggest methods for measuring surface roughness with brief working principle.
(j) Draw a neat sketch of pneumatic load cell.

Section-B

2. In modern measurement systems there is more reliance on electrical/electronic techniques of measurement. List some advantages of electrical transducers over mechanical transducers.
3. Draw a neat sketch of a reed type mechanical comparator and explain its working principle.
4. Explain clearly with the help of a neat sketch the working of an ultrasonic flow meter.
5. Define gauge factor of a strain gauge. How temperature compensation is done for strain gauges to measure axial load. Draw neat sketches only.
6. Draw neat sketches of optical and total radiation pyrometers for the measurement of temperature.

Section-C

7. Draw a neat enlarged sketch of a Bourdon tube pressure gauge and explain its working. How the sensitivity of this gauge can be increased? What are the materials used for the tube and the range of pressure to be measured?
8. Explain with the help of a neat sketch the working of an electromagnetic flux meter giving advantages.
9. (a) Draw a neat sketch of a Proving ring and explain its working.
(b) Explain how a strain gauge torsion meter can be used for the measurement of torque. What method do you suggest for shafts rotating at high speeds.