

**B.TECH. SEM -VI MECHANICAL 2014 COURSE (CBCS) :  
SUMMER - 2018**

**SUBJECT : MECHANICAL MEASUREMENT & METROLOGY**

Day : **Friday**  
Date : **08/06/2018**

**S-2018-2439**

Time : **02.30 PM TO 05.30 PM**  
Max. Marks : 60

**N.B.:**

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Use of non-programmable **CALCULATOR** is allowed.
- 4) Assume suitable data if necessary.

**Q.1** The drag coefficient  $C_D = \frac{F_D}{\left(\frac{1}{2} \rho v^2\right) \left(\frac{\pi D^2}{4}\right)}$  is to be reported for the flow of [10]

water over a strut mounted sphere. The drag  $F_D$  is measured directly with a force transducer, the freestream velocity  $v$  is measured with a pitot-static probe and the sphere diameter  $D$  is measured with a micrometer. The table below gives nominal values of the measurement variables and water density  $\rho$ , as well as estimates for the bias and precision limits of each variable at the 95% confidence level. Estimate the uncertainty in the reported drag coefficient  $C_D$  at a confidence level of 95% based on Bias limit and Precision limit.

Measured Variable, $X_i$	Bias Limit $W_i$	Precision Limit $P_i$
Drag force $F_D$	0.05 N	0.04 N
Water density	0.3%	--
Freestream Velocity $V$	0.15 m/s	0.22 m/s
Sphere diameter $D$	0.11 mm	0.08 mm

**OR**

**Q.1** Explain in detail various types and sources of error in the measurement system. [10]

**Q.2** Explain with the help of neat sketches the principle and construction of an auto-collimator. [10]

**OR**

**Q.2** State the meaning of wringing. What are the essential conditions for wringing of slip gauges and also state the accessories used with slip gauges. [10]

**Q.3** Draw neat block diagram of a generalized Data Acquisition System and explain it in detail. [10]

**OR**

**Q.3** Write a short note on following: [10]

- a) Electromagnetic Flow Meter      b) McLeod Gauge

**Q.4** What is a comparator? How they are classified? State the various uses of comparators. [10]

**OR**

**Q.4** What is meant by CMM? Briefly explain different types of CMM. [10]

**Q.5** Explain working of Incremental Encoder and state its applications. [10]

**OR**

**Q.5** Describe the procedure to measure the vibration by using displacement seismic accelerometer. [10]

**Q.6** Define the following in connection with surface texture assessment: [10]

- a) Roughness    b) Waviness    c) Lay    d) Sampling length

**OR**

**Q.6** Describe a gear tooth Vernier Caliper and explain its use for checking tooth thickness and depth of tooth. [10]

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