Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH(AUE)OLD/SEM-4/AUE-406/2012

2012

MEASUREMENT AND INSTRUMENTATION

Time Allotted : 3 Hours *Full Marks :* 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Objective Type Questions)

1. Answer the following questions : 10 × 1 = 10

A) Choose the correct alternatives for the following :

i) Angle Deckor is one type of

a) auto-collimator b) optical square

c) clinometer d) angle gauge.

ii) Profile of a gear tooth can be checked by

a) sine bar

b) bench micrometer

c) optical pyrometer

d) optical projector.

iii) On a triple thread screw

a) lead = pitch b) lead = 3 pitch

c) lead = 1/2 pitch d) lead = 9 pitch.

iv) The thread micrometer measures

a) the major diameter of the thread

b) the minor diameter of the thread

c) the effective diameter of the thread

d) the root diameter of the thread.

v) Repeatability of measuring equipment is

a) the capability to indicate the same reading again for a given measurement

b) a measure of how close the reading is to the true size

c) difference between measured value and actual value

d) the smallest change in measure that can be measured.

B) Answer the following in brief :

vi) What do you mean by instrumentation ?

vii) What do you mean by standard deviation ?

viii) What do you mean by static error ?

ix) What do you mean by standard ?

x) What do you mean by precision ?

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. Explain clearly the objective of DAS.

3. Discuss the function and relative merits of open loop and closed loop control systems.

4. Prove that the involute function of a gear tooth

   $\delta = \tan\phi - \phi$, where ϕ is the pressure angle.

5. What are the different methods of measuring angles ? Explain the principle of autocollimator for measuring small angular differences.

6. What are the various types of pitch errors on thread component ? What do you understand by drunken thread ?

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7. What do you mean by transducers ? How are they classified ? What are the important parameters of it ? Write down the advantages of electrical transducer. 2 + 2 + 5 + 6

8. a) Why is it that the use of a sine bar is not recommended for angles larger than 45° if high accuracy is demanded ? How do you calibrate a precision polygon ?

   b) Show, for a sine bar, that the error of angular setting θ arising from errors of the dimension l and h is given by :

   $$\Delta\theta \text{ (radians)} = (\sec\theta/l)\,\Delta h - (\tan\theta/l)\,\Delta l$$

   c) If, for a 100 mm sine bar, the setting error $\Delta\theta$ is not to exceed 15 seconds of arc when Δl = + 0·004 mm and Δh = – 0·002 mm, what is the maximum value of θ which the sine bar may be set ? (3 + 5) + 3 + 4

9. a) With a neat sketch, illustrate how the effecive diameter of a screw thread may be checked using 2-wire system. Derive an expression for the 'best size' wire.

   b) What are the various methods for measuring gear tooth thickness ? Determine the gear tooth vernier caliper settings to measure the gear tooth thickness.

   c) How do you use the property of interference of light to check the height of gauge block ? (4 + 2) + (2 + 4) + 3

10. What do you mean by LVDT ? What type of transducer is it ? Draw the circuit diagram and explain its operation. Write down the advantages and disadvantages of LVDT.

    2 + 1 + 7 + 5

11. Write short notes on any *three* of the following : 3 × 5

    a) Taylor-Hobson Talysurf

    b) Use of optical flat

    c) Liquid crystal display

    d) Measurement of velocity in automobiles.