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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 :

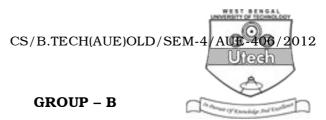
- $10 \times 1 = 10$
- A) Choose the correct alternatives for the following:
 - i) Angle Deckor is one type of
 - a) auto-collimator b) optical square
 - c) clinometer
- d) angle gauge.
- ii) Profile of a gear tooth can be checked by
 - a) sine bar
 - b) bench micrometer
 - c) optical pyrometer
 - d) optical projector.

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- 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?

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(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

- 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 $\delta = tan \; \varphi \varphi, \; where \; \varphi \; is \; the \; pressure \; angle.$
- 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. $3 \times 15 = 45$

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

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- 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:

$$\Delta\theta$$
 (radians) = (sec θ/l) Δh – (tan θ/l) Δl

- c) If, for a 100 mm sine bar, the setting error $\Delta\theta$ is not to exceed 15 seconds of arc when $\Delta l = + 0.004$ mm and $\Delta h = -0.002$ 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.