ELIZADE UNIVERSITY, ILARA-MOKIN, ONDO STATE, NIGERIA

DEPARTMENT OF MECHANICAL ENGINEERING

SECOND SEMESTER EXAMINATIONS
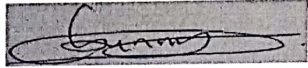
2018/2019 ACADEMIC SESSION

COURSE: MEE 308 – Metrology (3 Units)

CLASS: 300 Level Mechanical Engineering

TIME ALLOWED: 3 Hours

INSTRUCTIONS: Answer any **THREE** questions in **Section A** & any **TWO** in **Section B.**

Date: July, 2019

HOD'S SIGNATURE

SECTION A

Question 1

    a. Define the following terms:
        i. Metrology
        ii. Accuracy
        iii. Calibration
        iv. Error
    b. Differentiate between "Accuracy" and "Precision"
    c. List and explain 2 methods of measurements in Metrology.

Question 2

    a. List and explain any 5 geometrical features of measurement you know.
    b. With the aid of well labelled diagrams, explain the following measuring Instruments:
        i. Vernier Callipers;
        ii. Micrometer Screw Gauge;
        iii. Vernier Height Gauge;
    c. Define the term "Linear Metrology".

Question 3

a. Define the term "Profilometry".
b. Write short notes on the following types of comparators;
    i.   Johansson Mikrokator;
    ii.   Dial indicator;
    iii.   Mechanical-Optical Comparator.
c. Explain the following with examples
    i.   S.I Base Units
    ii.   S.I Derived Units

Question 4

a. List four differences between electrical and pneumatic comparators
b. A machinist using measuring equipment got the readings as shown below.
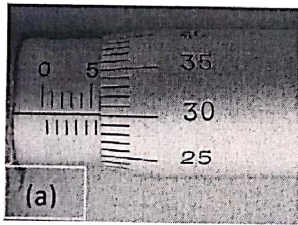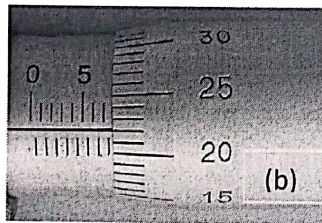What is the reading on Figure 1a &b?

Fig. 1a   Fig. 1b

c. List 4 reasons for precision in Engineering.

SECTION B

Question 5

a. Explain the importance of Tolerance with respect to Cost, Functional requirement, and Ultimate failure.
b. Explain the concept of interchangeability (Category of interchangeability inclusive)
c. Explain briefly, four different categories of Tolerance
d. Explain different categories of Geometric Tolerance

Question 6

a. Draw the different types of Fit separately and explain each of them.
b. Differentiate between minimum clearance and minimum interference
c. Tolerances for a hole and shaft assembly having a nominal size of 50 mm are as follows:

$$\text{Hole} = 50^{+0.02}_{-0.00} \text{ mm and Shaft} = 50^{+0.05}_{-0.08} \text{ mm}$$

Determine the following:
    i.   Maximum and minimum clearance

    ii.   Tolerance on the shaft and hole

    iii.   Allowance

    iv.   Lower limit of hole and higher limit of shaft

    v.   Type of Fit

d. Explain manufacturing cost and work tolerance curve.

Question 7

a. What is autocollimators? Mention types and where they are being used.

b. With the aid of diagram, explain the working principle of autocollimator.

c. State mechanical engineering applications of autocollimator.

d. With the aid of diagram, explain how autocollimator can be used to measure parallelism of two surfaces.