UNIVERSITY COLLEGE TATI (UC TATI)

FINAL EXAMINATION QUESTION BOOKLET	
COURSE CODE	: DTM 2122
COURSE	: ENGINEERING METROLOGY
SEMESTER/SESSION	: 1-2022/2023
DURATION	: 2.5 HOURS

Instructions:

1. This booklet contains 5 questions. Answer **all questions.**
2. All answers should be written in answer booklet.
3. Write legibly and draw sketches wherever required.
4. If in doubt, raise your hands and ask the invigilator.

DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO

THIS BOOKLET CONTAINS 7 PRINTED PAGES INCLUDING COVER PAGE

QUESTION 1

Engineering metrology is an exciting industry to work in. It deals with all kind of manufacturing and engineering companies from the smallest to the largest. However, errors in measurement may cause quality and efficiency of production to drop significantly.

a) **Describe** the term of accuracy (2 Marks)

b) **Clarify** three (3) objectives of engineering metrology. (6 Marks)

c) With aid of sketch, **compare** the difference between systematic error and random error. (7 Marks)

d) **Classify** two (2) types source of error that can contribute to measurement errors. (10 Marks)

QUESTION 2

Measurement method is the process used to obtain data describing the factors of a process or the quality of the output of the process. Meanwhile gauge is an inspection tool used to check a workpiece against its allowed tolerances.

a) **Compare** differences between traditional measuring method and modern measuring method (7 Marks)

b) **Classify** the term and give example of the instruments for this traditional measuring method.
   i. Direct reading. (5 Marks)
   ii. Indirect reading (5 Marks)

c) With aid of sketch, **show** one (1) example of gauges. (3 Marks)

d) Figure 1 below refers to an inspection tool used to check a workpiece against its allowed tolerances. Please **explain** the process.

(4 Marks)

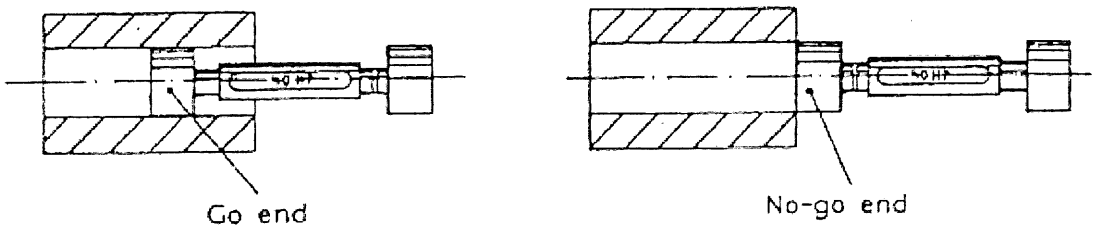

Figure 1: Inspection process

QUESTION 3

Limit and fit are two extreme permissible sizes of dimension between which actual size of dimension is contained. The permissible level of geometric dimensioning tolerancing (GDT) defining based on their function using ASME/ANSI or ISO which cannot be compromised.

a) **Define** the term:

i. Tolerances (2 Marks)

ii. Datum (2 Marks)

b) Base on figure 2, **compare** two (2) categories of tolerance classification (3 Marks)

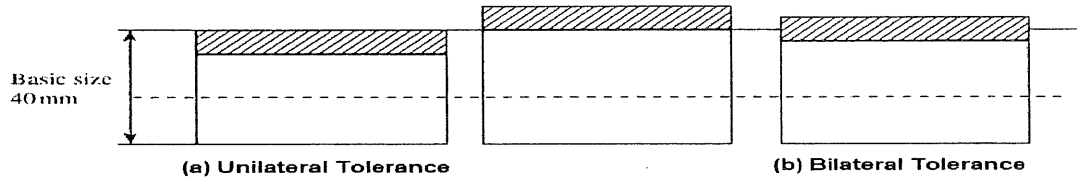

Figure 2: tolerance classification

c) **Sketch** and give the dimension for the basic hole system. Given the maximum clearance is 0.050mm. If minimum diameter of shaft is 10.461 mm while hole and shaft have tolerances 0.011mm and 0.010mm respectively, determine:

i. Maximum diameter of hole (3 Marks)

ii. Minimum diameter of hole (3 Marks)

d) **Sketch** and **explain** two (2) types of symbols & abbreviation use in GDT. (4 Marks)

QUESTION 4

In ensuring the highest quality data acquisition, CMM is normally used to inspect surface finish.

a) **Identify** three (3) factors affecting surface texture. (3 Marks)

b) **Define** surface roughness parameter: Ra, Rq (RMS) and Ry. (8 Marks)

c) **Discuss** the advantages of CMM (5 Marks)

QUESTION 5

A calibration is simply comparison between the actual value given by the instrument or tool and a known value. While gauges are the tools which are used for checking the size, shape and relative positions of various parts but not provided with graduated adjustable members.

a) **Identify** two (2) reason why gauges are important (6 Marks)

b) **Determine** two (2) purpose of calibration. (2 Marks)

c) **Briefly explain** the working procedure of handling thickness gauge. (4 Marks)

d) **Solve** the reading value (metric) shown for each figures.

i. (3 Marks)

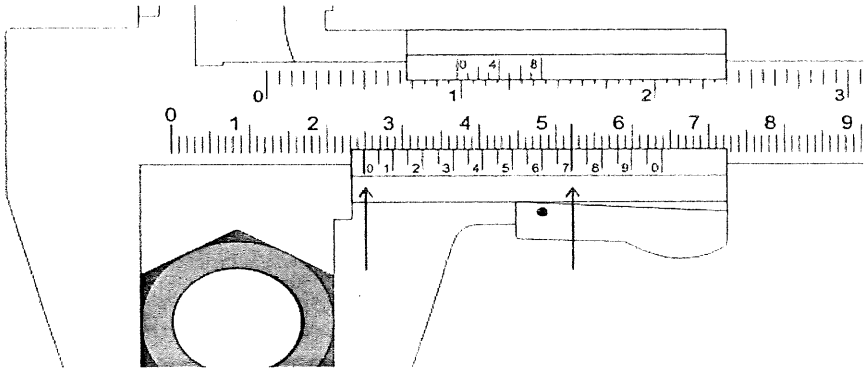

Figure 3: Vernier Caliper

ii. (3 Marks)

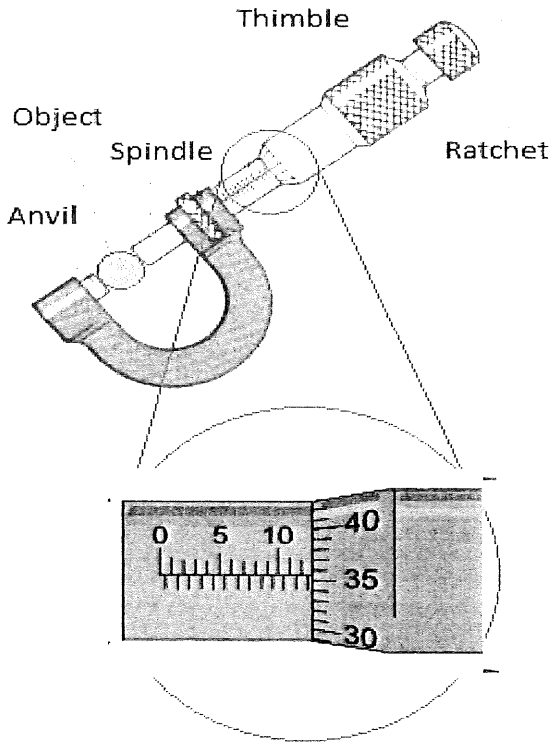

Figure 4: Micrometer

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Criteria	Marks
All questions answered will be marked according to the Answer scheme	/100