



**MASINDE MULIRO UNIVERSITY OF
SCIENCE AND TECHNOLOGY
(MMUST)**

MAIN CAMPUS

**UNIVERSITY EXAMINATIONS
2022/2023 ACADEMIC YEAR**

FOURTH YEAR SECOND SEMESTER EXAMINATIONS

**FOR THE BACHELOR OF SCIENCE
IN
TECHNOLOGY EDUCATION (MECHANICAL ENGINEERING)**

COURSE CODE: TEM 452

COURSE TITLE: METROLOGY

DATE: 18th April 2023

TIME: 08:00-10:00

INSTRUCTIONS TO CANDIDATES

Question ONE (1) is compulsory
Answer Any Other TWO (2) questions

TIME: 2 Hours

MMUST observes ZERO tolerance to examination cheating

QUESTION ONE**(30 marks)**

- a) In metrology, measurement is the one of the most important aspects, briefly describe what is measurement **(2 marks)**
- b) Measurement is an important requirement in the engineering field, outline five (5) reasons why you think there is need for measurement **(5 marks)**
- c) With regards to classification of standards, differentiate between line and end standards and give relevant examples of each **(4 marks)**
- d) With regards to angular measurement and with the use of an appropriate diagram, explain the working principle of a sine bar **(7 marks)**
- e) Comparators can give precision measurements, with consistent accuracy by eliminating human error. Give any four (4) classes of comparators **(2 marks)**
- f) In reference to auto collimation, differentiate between a collimator and a telescope **(4 marks)**
- g) List three (3) functions of an interferometer **(3 marks)**
- h) List three (3) methods of measuring surface finish in metrology **(3 marks)**

QUESTION TWO**(20 marks)**

- a) Measurement can be done using a variety of methods. In this regard, discuss the following methods of measurement **(12 marks)**
- I. Method of direct measurement:
 - II. Method of measurement by comparison
 - III. Method of measurement by transposition
 - IV. Method of measurement by complement
- b) With regards to the terms involved in measurement, explain the following terms **(8 marks)**
- I. Sensitivity
 - II. Readability
 - III. Accuracy
 - IV. Precision

QUESTION THREE**(20 marks)**

- a) Differentiate between Limit and Slip gauges **(4 marks)**
- b) With reference to classification of comparators and with the use of appropriate diagrams, explain the following types of comparators **(10 marks)**
- I. Mechanical comparators
 - II. Electrical comparators
- c) Explain how an autocollimator works using an appropriate diagram **(6 marks)**

QUESTION FOUR

(20 marks)

- a) In metrology, different types of errors can be experienced, in this regard, discuss the following categories of errors **(8 marks)**
- I. Error of observation
 - II. Errors Based on control
- b) With regards to interferometers and with the use of appropriate diagrams, explain how the following types of interferometers work **(12 marks)**
- I. The Fizeau Interferometer
 - II. The Michelson Interferometer