(University of Choice)

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

MAIN CAMPUS

UNIVERSITY EXAMINATIONS 2021/2022 ACADEMIC YEAR

FOURTH YEAR SECOND SEMESTER SPECIAL/SUPPLIMENTARY EXAMINATIONS

FOR THE BACHELOR OF TECHNOLOGY EDUCATION IN MECHANICAL ENGINEERING

COURSE CODE: TEM 452

COURSE TITLE: METROLOGY

DATE: 6/10/2022 **TIME:** 9:00 AM – 11:00 AM

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) Name any three instruments that can be used for straightness measurements **(3marks)**

b) For measurement to be effective, there are certain requirements .Briefly outline two important requirements of measurement **(2 marks)**

c) Outline any five (5) elements that the generalized measuring systems should have **(5 marks)**

d) State any three reasons why we need to carry out measurements **(3 marks)**

e) List three (3) applications of an autocollimator **(3 marks)**

f) Name two functions of a screw **(2 mark)**

g) Outline any five classes of measuring instruments based on the application mode of operation, the nature of energy conversion and the nature of output signal. **(5 marks)**

h) Outline any three (3) purposes of an interferometer **(3 marks)**

i) List any four (4) characteristics of a good comparator **(4 marks)**

QUESTION TWO **(20 marks)**

a) Interferometers are one of the widely used equipment in metrology, explain the principle of operation of the following types of interferometers using appropriate diagrams **(12 marks)**

I. The Mach-Zender Interferometer
II. The Sagnac Interferometer

b) Explain the following terms involved in measurement. **(8 marks)**

I. Correction
II. Calibration
III. Interchangeability
IV. Constant of a measuring instrument

QUESTION THREE **(20 marks)**

a) Explain the operation principle of the following types of comparators with the use of appropriate diagrams, **(12 marks)**

I. Pneumatic comparators
II. Mechanical optical comparators

b) In metrology, different types of errors can be experienced. In this regard, discuss the following categories of errors **(8 marks)**

I. Errors of Measurement

II. Instrumental errors

QUESTION FOUR **(20 marks)**

a) Explain how a sine center is used to carry out angular measurements in metrology using an appropriate diagram **(5 marks)**

b) Briefly explain the difference between constructive and destructive interference **(3 marks)**

c) Discuss the following methods of measurement that can be used in metrology **(12 marks)**

I. Method of indirect measurement
II. Method of measurement by substitution
III. Method of measurement by interpolation
IV. Method of measurement by extrapolation