



THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of JKUAT)

(A Centre of Excellence)

Faculty of Engineering & Technology

DEPARTMENT OF MECHANICAL & AUTOMOTIVE ENGINEERING

UNIVERSITY EXAMINATION FOR:
BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING

EMG 2312: METROLOGY

END OF SEMESTER EXAMINATION

SERIES: DECEMBER 2012

TIME: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- *Answer Booklet*

This paper consists of **FIVE** questions. Answer any other **THREE** questions

Maximum marks for each part of a question are as shown

This paper consists of **THREE** printed pages

Question One

a) Distinguish the following methods of measurements:

(i) Direct Method

(ii) Indirect Method

(3 marks)

b) Explain: (i) Measurement

(ii) Inspection

For each provide examples

(4 marks)

c) Describe the following using examples:

(i) Line standards

(ii) Light (wavelength) standards

(iii) End standards (6 marks)

- d) With the aid of a diagram, outline how to determine the actual size of a 50mm slip gauge starting with three gauges namely:
TWO 50mm gauge and one master 100mm slip gauge. (7 marks)

Question Two

- a) Give **FOUR** basic set of shapes for typical inspection gauges. (2 marks)
- b) Describe the procedure for preparing simple “GO” and “NOT GO” gauges (6 marks)
- c) State Taylors Principle of Gauging. Briefly illustrate this principle. (10 marks)
- d) Distinguish between unilateral and bilateral tolerance. (2 marks)

Question Three

- a) State **FOUR** common principles used to design comparators. (4 marks)
- b) Outline **FIVE** desirable characteristics of comparators. (5 marks)
- c) With the aid of a well labeled diagram, show the working principle of a mechanical comparator. (8 marks)
- d) Mention **THREE** advantages for use of electronic over mechanical comparators. (3 marks)

Question Four

- a) By use of examples, explain the difference between:
(i) Primary standard
(ii) Secondary standard
(iii) Working standard (6 marks)
- b) Explain the following terms in precision measurement:
(i) Resolution
(ii) Sensitivity
(iii) Calibration
(iv) Accreditation
(v) Traceability (10 marks)
- c) Explain **FOUR** sources of errors. (4 marks)

Question Five

- a) State the main requirements of slip gauges. How are slip gauges manufactured? **(6 marks)**
- b) Discuss limits, fits and tolerance in engineering metrology. **(6 marks)**
- c) Describe **FOUR** main features on a calibration certificate. **(2 marks)**
- d) An angle of $98^{\circ} 27' 15''$ is to be developed using an angle gauge set below. Show the arrangement with a sketch.

Degrees	1, 3, 9, 27, 41, 90
Minutes	1, 3, 9, 27
Seconds	3, 6, 18, 30

(6 marks)