



THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A CONSTITUENT COLLEGE OF JKUAT)

Faculty of Engineering and Technology

DEPARTMENT OF MECHANICAL AND AUTOMOTIVE ENGINEERING

Bachelor of Engineering in Mechanical Engineering

EMG 2312 : METROLOGY

SPECIAL/SUPPLEMENTARY EXAMINATIONS

YEAR II SEMESTER I

SERIES: MARCH, 2012

TIME: 2 HOURS

Instructions to Candidates:

This paper consists of **FIVE** Questions. Attempt any **THREE** Questions.

All questions have equal marks.

This paper consists of **THREE printed pages**.

QUESTION ONE

- (a) Mention **THREE** types of comparators. **(3 marks)**
- (b) State **SIX** design requirements of a comparator. **(6 marks)**
- (c) With the aid of sketches, give a step by step description of a comparative measurement. **(6 marks)**
- (d) With the aid of a diagram, show the main features of a Johanson Microkator comparator. **(5 marks)**

QUESTION TWO

- (a) State Taylor's Principle of gauging and demonstrate how the principle is applied in the design of the NOT-GO element of a solid plug gauge. **(4 marks)**
- (b) With the aid of a sketch show the correct position of a taper plug gauge when checking holes of the right size. **(4 marks)**
- (c) On the extract of Table of Primary Selection of fits provided (Bs 4500) derive the dimensions of a hole and a shaft of nominal diameter 27.6mm so that a precision clearance fit is obtained.
Determine also the maximum and minimum clearance of the assembly. Take the tolerance unit as 0.001mm. **(12 marks)**

QUESTION THREE

- (a) Distinguish between:
- (i) Line standard
 - (ii) End standard
 - (iii) Wavelength standards
- (4 marks)**
- (b) Give a brief explanation of calibration of instruments. **(4 marks)**
- (c) State **FOUR** instruments to be found in a standards room. **(4 marks)**
- (d) You are provided with an M88/2 set of slip gauges shown below. Table Q3. Build up a combination of 83.726mm. State the number of gauges used.

Size (mm)	Increment (mm)	No.
1.005	-	1
2.001 – 2.009	0.001	9
2.01 – 2.49	0.01	49
0.5 – 9.5	0.5	19
10 – 100	10.0	10

(2 marks)

QUESTION FOUR

- (a) State **TWO** types of gear measurement. **(2 marks)**

- (b) Show that the tooth thickness for spur and helical gears at the pitch line is given by:

$$w = \frac{2NM}{N} \sin \frac{90}{N}$$

Where W = Tooth thickness
N = Number of teeth
M = Module

(2 marks)

- (d) Calculate the setting of the Gear Tooth Vernier to inspect a gear having 34 teeth and a module of 5mm. **(8 marks)**

QUESTION FIVE

- (a) State **THREE** screw thread series. **(3 marks)**

- (b) (i) Describe how to measure the minor diameter of an external screw thread.

- (ii) The simple effective diameter of an external metric screw thread using a **TWO** wire method.

(12 marks)

- (c) Derive an expression for the Best size wire. Explain “Best size wire size”. **(5 marks)**