(Knowledge for Development)

# KIBABII UNIVERSITY

## UNIVERSITY EXAMINATIONS

## 2017/2018 ACADEMIC YEAR

## FIRST YEAR FIRST SEMESTER

## MAIN EXAMINATION

## FOR THE DEGREE OF BACHELOR OF EDUCATION AND BACHELOR OF SCIENCE

**COURSE CODE:** MAT 101

**COURSE TITLE:** FOUNDATION MATHEMATICS I

**DATE:** 17/01/18 **TIME:** 9 AM -11 AM

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## INSTRUCTIONS TO CANDIDATES

Answer Question One and Any other TWO Questions

TIME: 2 Hours

**QUESTION ONE (30 MARKS)**

(a) Define the following terms giving an example in each case

(i) A set **(2mks)**

(ii) A totology **(2mks)**

(b) Given two propositions A and B. Make a truth table for $A \Rightarrow B$. **(3mks)**

(c) Taking $\mathbb{R}$, the set of real numbers as the universal set, give four examples of infinite sets whose complement sets are also infinite. **(4mks)**

(d) Let $z_1 = 3 +\text{-}i$ and $z_2 = -2 + 5i$, find $\frac{z_1}{z_2}$. **(4mks)**

(e) How many five letter code words can be formed from the letters of the word ALGEBRA if the code words must begin with A and end with A? **(4mks)**

(f) A function f is given by f: $x \rightarrow \frac{1}{|x|-1}$ whose domain is $\{x : x = 1, x \neq -1\ x \in \mathbb{R}\}$; Show that f is not a bijection. **(4mks)**

(g) Given that Sin A = $\frac{3}{4}$ and $0^0 < A < 90^0$, find without using tables the other four trigonometric ratios for angle A **(4mks)**

(h) In how many ways can five basketball players be selected from a team of twelve players to participate in a friendly match. **(3mks)**

**QUESTION TWO (20 MARKS)**

(a) Use addition formula to evaluate Cos $135^0$. **(4mks)**

(b) Without using tables or a calculator evaluate Sin $240^0$. **(2mks)**

(c) Simplify Cos $80^0$ Cos $20^0$ + Sin $80^0$ Sin $20^0$. **(2mks)**

(d) Use double angle identities to evaluate Cos $60^0$. **(4mks)**

(e) Express Sin 6x – Sin 4x as a product. **(3mks)**

(f) Show that Sin x + Cos xCot x = Cosec x **(5mks)**

**QUESTION THREE (20 MARKS)**

(a) How many 11- letter code words can be formed from the letters of the word INDEPENDENT? **(3mks)**

(b) In how many ways can 4 boys and two girls be seated in a raw if

(i) The girls must not be separated **(2mks)**

(ii) The girls are separated **(2mks)**

(c) In how many ways can a boy select 3 toffees, 5 chestnuts and 4 berries from a jar containing 8 toffees, 9 chestnuts and six berries? **(3mks)**

(d) A box contains 15 balls; 5 of which are red, 4 are green and 6 are blue. In how many ways can 3 balls be chosen if

(i) There is no restriction? **(2mks)**

(ii) The balls are of the same colour ? **(3mks)**

(iii) The balls are of different colour? **(2mks)**

(iv) Only two balls are of the same colour? **(3mks)**

**QUESTION FOUR (20 MARKS)**

(a) If z = 1 + i, find the imaginary and the real parts of $z + \frac{1}{z}$. **(4mks)**

(b) Given $z_1 = (3- i)$ ; $z_2 = 2i$ and $z_3 = 2-2i$, show that $|z_1 - z_3| = |z_1 - z_2|$. **(5mks)**

(c) Find the fourth roots of i. **(6mks)**

(d) If a = 3 –I and b = 1 + 2i, evaluate $\frac{a}{2b}$. **(3mks)**

(e) Represent -5 + 6i on an Argand diagram. **(2mks)**

**QUESTION FIVE (20 MARKS)**

(a) Given X= {2,4,6,8,10,12} and Y={2,3,4,5,6,7,8}. Determine n(X ∪Y). **(4mks)**

(b) Determine the truth tables for the following propositions

(i) $\sim(A \Rightarrow B) \vee (\sim A \wedge \sim B)$. **(7mks)**

(ii) $(A \wedge B) \Rightarrow [\sim(A \vee B) \Rightarrow A]$. **(7mks)**

(c) Use a venn diagram to show that the sets A – B and $A \cap B^c$ are equal. **(2mks)**