(35)

(Knowledge for Development)

KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS

2016/2017 ACADEMIC YEAR

FIRST YEAR THIRD SEMESTER

MAIN EXAMINATION

FOR THE DEGREE OF BACHELOR OF EDUCATION AND BACHELOR OF SCIENCE

COURSE CODE: **MAT 101**

COURSE TITLE: **FOUNDATION MATHEMATICS I**

DATE: 13/09/17 **TIME:** 8 AM -10 AM

INSTRUCTIONS TO CANDIDATES

Answer Question One and Any other TWO Questions

TIME: 2 Hours

This Paper Consists of **4 Printed Pages**. Please Turn Over.

QUESTION ONE (30 MARKS)

a. Define the following

   i. Equal sets (3 marks)

   ii. Union of sets (2marks)

   iii. Intersection of sets (2marks)

   iv. Modular arithmetic (2marks)

b. Find 111.222(mod246) (3marks)

c. Define the following

   i. Statements (2marks)

   ii. Conjunction (2marks)

   iii. Disjunction (2marks)

d. How many different number plates for cars can be made if each number plate contains four of the digits 0 to 9 followed by a letter Ato Z, assuming that

   i. No repetition of digits is allowed (4 marks)

   ii. Repetition of digits is allowed (3marks)

e. Work out the inverses of all numbers in $(z_5, \times)$ (5marks)

QUESTION TWO (20MARKS)

a. In how many ways can 6 girls and 2 boys be arranged in a row

   i. Without restriction (2marks)

   ii. Such that the 2 boys are together (4marks)

   iii. Such that the boys are together (2marks)

b. In how many ways can a group of 4 boys be selected from 10 if

   i. The eldest boy is included in each group (3marks)

   ii. The eldest boy is excluded (3marks)

c. Out of 5 mathematicians and 7 engineers, a committee consisting of 2 mathematicians and 3 engineers is to be formed. In how many can this be done if

   i. Any mathematician and any engineer can be included (3marks)

   ii. Two particular mathematicians cannot be in the committee (3marks)

QUESTION THREE (20MARKS)

a. Convert the following numbers into decimals

i. $(101.01)_2$ (2marks)

ii. $(123.4)_8$ (2marks)

iii. $(123.4)_{16}$ (2marks)

b. Convert $(50)_{10}$ to

i. Binary (2marks)

ii. Octal (2marks)

iii. Hexadecimal (2marks)

c. Convert $(0.8125)_{10}$ to

i. Binary (2marks)

ii. Octal (2marks)

d. Convert $(9)_{10}$ to BCD (2marks)

e. Add 10110 to 11101 (2marks)

QUESTION FOUR (20MARKS)

a. Define the following

i. Function (2marks)

ii. The vertical line test (2marks)

iii. Range of a function (2marks)

b. State the domain and range of $y = \sqrt{x+4}$ (4marks)

c. Let $f: \mathbb{R} \to \mathbb{R}$ defined by $f(x) = \frac{x^2-1}{x^2+1}$ and $g: \mathbb{R} \to \mathbb{R}$ by $g(x) = x^3$. Find

i. fg (3marks)

ii. gf (3marks)

d. Consider a function $f: (1, -\infty) \to (0,1)$ defined by $f(x) = \frac{x-1}{x+1}$. Find the inverse of $f(x)$ (4marks)

QUESTION FIVE (20MARKS)

a. Express the number $\frac{-1+3i}{2+5i}$ in the form a+bi (3marks)

b. Find the roots of the equation $x^2 + x + 1 = 0$ (3marks)

c. Write $z = 1 + i$ in polar form (3marks)

d. Find $\left(\frac{1}{2} + \frac{1}{2}i\right)^{10}$ (4marks)

e. Calculate

i. $sin\left(\frac{10}{6}\pi\right)$ (4marks)

ii. $cos\left(\frac{10}{6}\pi\right)$ (3marks)