(*Knowledge for Development*)

KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS

2020/2021 ACADEMIC YEAR

FIRST YEAR FIRST SEMESTER

SUPPLEMENTARY EXAMINATION

FOR THE DEGREE OF BACHELOR OF SCIENCE MATHEMATICS, PHYSICS AND CHEMISTRY

COURSE CODE: MAP 111B/MAT101

COURSE TITLE: FOUNDATION MATHEMATICS I

DATE: 30/9/201   **TIME:** 2 PM – 4 PM

INSTRUCTIONS TO CANDIDATES

Answer Question One and Any other TWO Questions

TIME: 2 Hours

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

QUESTION ONE COMPULSORY (30 MARKS)

a. Define the following

      i.   Set   (2marks)

      ii.   Union of sets   (2marks)

      iii.   Intersection of sets   (2marks)

      iv.   Proposition   (2marks)

b. Using truth tables, show that $A \lor (B \land C) \equiv (A \lor B) \land (A \lor C)$ (10marks)

a) Convert $(143)_{10}$ to

      i.   Binary   (2marks)

      ii.   Octal   (2marks)

      iii.   Hexadecimal   (2marks)

a. 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 TWO (20MARKS)

a) Given $Z = 3 - i$ and $X = -2 + 5i$, represent the following numbers on an argand diagram

      i. Z (2marks)

      ii. X (2marks)

      iii. $Z + X$ (3marks)

      iv. $Z - X$ (3marks)

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

QUESTION FOUR (20MARKS)

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

b) Add 10110 to 11101   (2marks)

c) Define the following

   i.   Function   (2marks)

   ii.   The vertical line test   (2marks)

   iii. Range of a function   (2marks)

d) 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)

e) Express the following complex numbers in the $x + yi$ form.

   i. $(7 + 2i) + (3 - 2i)$ (2marks)

   ii. $(4 - 3i) - (3 - 7i)$ (2marks)

QUESTION FIVE (20MARKS)

a) Bank XYZ has 300 customers. 200 of the customers have taken car loans, 155 of them

   have mortgage loans and 108 of them school fees loans. Of these, 65 have taken both

   school fees and mortgage loans, 48 have taken both school fees and car loans and 90

   customers have taken both car and mortgage loans. 20 customers have taken all three

   loans.   (12marks)

   i.   Draw a venn diagram to illustrate the above information

   ii.   How many customers have not taken any loan from the bank?

   iii. How many customers have exactly one loan from the bank?

   iv.   How many customers have exactly two loans from the bank?

b) Find the roots of the equation $x^2 + x + 1 = 0$ (4marks)

      c) Write $z = 1 + i$ in polar form   (4marks)