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(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

COURSE CODE: **MAP 111**

COURSE TITLE: **FOUNDATION MATHEMATICS I**

DATE: 25/07/2022 **TIME:** 11:00 AM - 1:00 PM

INSTRUCTIONS TO CANDIDATES

Answer Question One and Any other TWO Questions

TIME: 2 Hours

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 $A\vee(B\wedge C) \equiv (A\vee B) \Rightarrow (A\vee C)$ (10marks)

c. There are 400 students in a class. 50 of them take German and 150 take Latin. Some students take two languages. There are 230 students who take no language whatsoever. How many students are there who take at least one language? (5marks)

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

a) 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. fog (3marks)

ii. gof (3marks)

QUESTION TWO (20MARKS)

a) Given that |z|=10 and arg(z)=120^o, find z (3marks)

b) Show that $\cos 2A = 2\cos^2 A - 1$ (4marks)

c) From a group of 7 men and 6 women, five persons are to be selected to form a committee so that at least 3 men are there in the committee. In how many ways can it be done? (5marks)

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

i. The eldest boy is included in each group (4marks)

ii. The eldest boy is excluded (4marks)

QUESTION THREE (20MARKS)

a) Sketch the graph of $f(x) = 3x - x^2$ and find the domain and range (5marks)

b) Convert the following numbers into decimals

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

ii. $(123.4)_8$ (3marks)

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

c) Find the least value of x such that $96 \equiv \frac{x}{7} \ mod\ 5$ (4marks)

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

QUESTION FOUR (20MARKS)

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)

b) Define the following

i. One to one function (2marks)

ii. On-to function (2marks)

iii. Range of a function (2marks)

c) Solve the following without the use of calculators

i. Tan(-75) (4marks)

d) 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) There are 15,000 students at college X. Of those students, 1,700 are taking both ethics and metaphysics this semester. There are 2,200 total students taking ethics. 9,500 students are taking neither of these classes. How many students are taking metaphysics this term? (6marks)

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

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

d) 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)