(Knowledge for development)

KIBABII UNIVERSITY

(KIBU)

UNIVERSITY EXAMINATIONS

2021/2021 ACADEMIC YEAR

END OF SEMESTER EXAMINATIONS

FIRST YEAR FIRST SEMESTER

FOR THE DEGREE IN

(INFORMATION TECHNOLOGY)

COURSE CODE: BIT 114

COURSE TITLE: BASIC MATHEMATICS FOR IT

DATE: 04/02/2022 TIME: 2.00 P.M. - 4.00 P.M.

INSTRUCTIONS

ANSWER **QUESTIONS ONE AND ANY OTHER TWO.**

This Paper Consists of 3 Printed Pages. Please Turn Over.

SECTION A (COMPULSORY QUESTIONS)

QUESTION ONE (30 MARKS)

(a) Given that $f(x) = 3x^3 + 1$, find derivative $f^1(x)$ from first principles (5 marks)

(b) Let A and B be two finite sets such that $n(A) = 20$, $n(B) = 28$ and $n(A \cup B) = 36$, find $n(A \cap B)$. (4 marks)

(c) Using truth tables evaluate $(P \rightarrow R) \wedge (Q \vee \neg R)$. (6 marks)

(d) Evaluate $\int xe^{x^2} dx$ (5marks)

(e) Consider the function $f(x) = \frac{8x-3}{x-2}$

(i) What is the range of f(x) (1 mark)

(ii) Find the inverse function of f(x) (4 marks)

(f) Let Q (x, y, z) denote the statement "$x^2+y^2=r^2$".

(i) What is the truth value of Q (3, 4, 5)? (2 marks)

(ii) What is the truth value of Q (2, 2, 3)? (3 marks)

SECTION B (STUDENTS TO CHOOSE)

QUESTION TWO (20 MARKS)

A travel agent surveyed 100 people to find out how many were able to speak English and Kiswahili. Thirty-one people were able to speak English, 26 people able to speak, and 12 people able to speak both.

(a) Draw a Venn diagram and use it to find the number of people who had visited: (10 marks)

(i) English or Kiswahili (2 marks)

(ii) Kiswahili but not English (1 mark)

(iii) Only one of the languages (2 marks)

(iv) Neither language. (1 marks)

(b) If A = {whole numbers between 1 and 8, the two numbers being exclusive} and

B = {odd numbers between 3 and 13 where the two are inclusive}, then find B – A making use of a Venn diagram (4 marks)

QUESTION THREE (20 MARKS)

If $f(x) = -2x/3$ and $g(x) = x^2 - 1$, evaluate $f(g(3))$ and $g(f(3))$.

(a) Evaluate

(i) $f(g(3))$ (4 marks)

(ii) $g(f(3))$ (4 marks)

(b) Evaluate the inverse of $(gf)(x)$ $[(gf)^{-1}(x)]$ (12 marks)

QUESTION FOUR (20 MARKS)

(a) Given that the equation defining an ellipse is $4x^2 + y^2 = 8$, find the tangent to the ellipse at a point (1, 2). (8 marks)

(b) The position of a particle is given by S (t) = 3t2 – t3, $t \geq 0$,

(i) Establish when the particle reaches a velocity of 0 m/s and explain the significance of this value of t (8 marks)

(ii) When does the particle have an acceleration of 0 m/s^2? (4 marks)

(iii)

QUESTION FIVE (20 MARKS)

(a) Determine if $((P \rightarrow Q) \wedge (Q \rightarrow R)) \rightarrow (P \rightarrow R)$ is a tautology or not (12 marks)

(b) Let P(x) be the statement "x spends more than five hours every day on LMS learning" where the domain for x consists of all students. Express each of these English statements using the notation formats (8 marks).

(i) There exists a student who spends more than five hours every day on LMS learning.

(ii) Every student spends more than five hours every day on LMS learning.

(iii) There exists a student who does not spend more than five hours every day on LMS learning.

(iv) Every student does not spend more than five hours every day on LMS learning.