(KNOWLEDGE FOR DEVELOPMENT)

KIBABII UNIVERSITY

(KIBU)

UNIVERSITY EXAMINATIONS

2020/2021 ACADEMIC YEAR

SPECIAL/SUPPLEMENTARY EXAMINATIONS

FIRST YEAR FIRST SEMESTER

FOR THE DEGREE IN

(INFORMATION TECHNOLOGY)

COURSE CODE: BIT 114

COURSE TITLE: MATHEMATICS FOR IT

DATE: 24/09/2021 **TIME:** 11.00 A.M. – 7.00 P.M.

INSTRUCTIONS

ANSWER QUESTIONS ONE AND ANY OTHER TWO.

QUESTION ONE (COMPULSORY) [30 MARKS]

a) Given that $f(x) = 2x^2 + 1$, find $f^{-1}(x)$ 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 $f(x) = \frac{7x-3}{x-1}$

(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 "$x^2+y^2=z^2$".

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

QUESTION TWO (20 MARKS)

(a) Show that $((P \rightarrow Q) \wedge (Q \rightarrow R)) \rightarrow (P \rightarrow R)$ is a tautology (12 marks)

(b) Let P(x) be the statement "x spends more than five hours every weekday in class," 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 weekday in class.

(ii) Every student spends more than five hours every weekday in class.

(iii) There exists a student who does not spend more than five hours every weekday in class.

(iv) Every student does not spend more than five hours every weekday in class.

QUESTION THREE (20 MARKS)

If $f(x) = -2x$ 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 $(gf)^{-1}(x)$ (12 marks)

QUESTION FOUR (20 MARKS)

- 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)
- The position of a particle is given by S (t) = 3t2 – t3, $t \geq 0$,
  a) Establish when the particle reaches a velocity of 0 m/s and explain the significance of this value of t (8 marks)
  b) When does the particle have an acceleration of 0 m/s^2? (4 marks)

QUESTION FIVE (20 MARKS)

A travel agent surveyed 100 people to find out how many of them had visited the cities of Mombasa and Kisumu (B). Thirty-one people had visited Mombasa, 26 people had been to Kisumu (B), and 12 people had visited both cities.

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

(i) Mombasa or Kisumu (B) (2 marks)

(ii) Kisumu (B) but not Mombasa (1 mark)

(iii) Only one of the two cities (2 marks)

(iv) Neither city. (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)