



(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 $\int x e^{x^2} dx$ (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 $S(t) = 3t^2 - t^3$, $t \geq 0$,
 - 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/s²? (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 $A = \{\text{whole numbers between 1 and 8, the two numbers being exclusive}\}$ and $B = \{\text{odd numbers between 3 and 13 where the two are inclusive}\}$, then find $B - A$ making use of a Venn diagram (4 marks)