JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

1^{ST} YEAR 1^{ST} SEMESTER EXAMINATION [**FULL-TIME**]

SMA 3114: ANALYTICAL METHODS FOR COMPUTING

INSTRUCTION: Answer question one (**COMPULSORY**) and any other **TWO** questions only

QUESTION ONE - *COMPULSORY* (30 MARKS)

(a). Illustrate on a Venn diagram, $A \cap (B \backslash C)$, if A, B, C are nonempty sets. (6 marks)

(b). Find the interior angles of triangle STV given that ST=7 cm, TV=9 cm and VS=11 cm. (6 marks)

(c). Define the following terms: Relation, Function and Subset. (6 marks)

(d). Given that $\mathcal{U} = \{1, 2, 3, ..., 9\}$, $P = \{1, 3, 4, 5\}$ and $Q = \{2, 3, 6, 7\}$ find $(P \cap Q \cap \mathcal{U})^c$, $P \cup Q^c$ and $\mathcal{P}(Q)$. (6 marks)

(e). Given that $f(x) = x^2 + 3x + 1$ and $g(x) = 2x - 3$, find $[fogof](x)$ and $(f + 3g)(-1)$. (6 marks)

QUESTION TWO (20 MARKS)

(a). State the rationality criterion for a number. (5 marks)

(b). Show that there is no rational number whose square is 3. (15 marks)

QUESTION THREE (20 MARKS)

(a). State and prove De'Morgan's first Law for any two nonempty sets S and T. (10 marks)

(b). The equation $x^2 - 2 = 0$ has no roots in the set of rational numbers. Explain. (4 marks)

(c). Solve the equation $16z^2 + 32z + 25 = 0$. (6 marks)

QUESTION FOUR (20 MARKS)

(a). Define Singleton set; disjoint sets; Domain of a function. (6 marks)

(b). A research conducted on the reading trends among 452 people gave the following data in respect of three types of newspapers:

Nation-150, Taifa leo - 101, Citizen - 123, Nation and Taifa leo - 39, Nation and Citizen - 52, Taifa leo and Citizen - 44. Those who read all the three newspapers are 25.

(i) Present the above information on a Venn diagram. (5 marks)

(ii) Find the total number of people who read at least two types of newspapers. (3 marks)

(iii) Find the total number of people who read two types of newspapers only. (2 marks)

(iv) Find the total number of people who read one type of newspaper only. (2 marks)

(v) Find the number of those who read none of the 3 newspapers. (2 marks)

QUESTION FIVE (20 MARKS)

(a) Express $\frac{1}{2+\sqrt{-9}} - \frac{1}{2-\sqrt{-9}}$ in the form $a + bi$ where $a, b \in \mathbb{R}$. (5 marks)

(b) When a number is divided by 9 the remainder is six and when divided by six, the remainder is three. Find three possible numbers of this type. (4 marks)

(c) Show that the sum of the first k natural numbers is $\frac{k(k+1)}{2}$, $k \neq 0$. (3 marks)

(d) Define Network, Graph and Algorithm as used in computing. (8 marks)