JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

1^{ST} YEAR 1^{ST} SEMESTER EXAMINATION

SMA 3114: ANALYTICAL METHODS FOR COMPUTING

INSTRUCTION: Answer question one (**compulsory**) and any other two questions only

QUESTION ONE(*COMPULSORY*) [30 MARKS]

(a). Given the set of numbers: 2, 2, 3, 5, 5, 7, 8. Compute the mean and find the median of this set. (3 marks)

(b). Given that $f(x) = \frac{x}{3}$ and $g(x) = x + 1$, find $(fog^{-1})(1)$. (4 marks)

(c). Show that $\frac{1}{Cosec\theta+Cot\theta} = \frac{1-Cos\theta}{Sin\theta}$. (4 marks)

(d). Solve triangle ABC given that AB=6 cm, BC=9 cm and CA=11 cm. (4 marks)

(e). Given that $\mathcal{U} = \{x : x\ is\ a\ digit\}$, $A = \{1, 3, 7\}$, $B = \{2, 3, 4, 8\}$ and $C = \{5, \{5, 9\}\}$. Find A^c, $A \cup B^c$ and $\mathcal{P}(C)$. (5 marks)

(f). Simplify: (i) $\frac{3}{2-\sqrt{2}}$ and (ii) $(\frac{1}{8})^{\frac{-1}{3}}$.(5 marks)

(g). Define the following terms as used in computing: Algorithm, Digraph, Network. (5 marks)

QUESTION TWO [20 MARKS]

(a) Show that there is no rational number whose square is 13. (7 marks)

(b) State and prove the first Law of De'Morgan for any two nonempty sets J and K. (6 marks)

(c) Given that $\mathcal{U} = \{1, 2, 3, ..., 9\}$, $A = \{1, 2, 3, 5\}$, $B = \{1, 2, 4, 6\}$ and

$C = \{1, 3, 4, 7\}$. Prove that $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$.(7 marks)

QUESTION THREE [20 MARKS]

(a). Define: Relation; Codomain and Symmetric difference. (6 marks)

(b). A research conducted on the dancing habits among 400 Bondo University College students gave the following data in respect of three types of music:

Hip-hop..151

Reggae...99

Blues..118

Hip-hop and Reggae..............................41

Hip-hop and Blues.................................49

Reggae and Blues..................................43

Dances to all the three types of music..20

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

(ii) Find the total number of students who dance to at least two types of music. (3 marks)

(iii) Find the total number of students who dance to two types of music only. (2 marks)

(iv) Find the total number of students who dance to one type of music only. (2 marks)

(v) Find the number of students who do not dance to any of the 3 types of music. (2 marks)

QUESTION FOUR [20 MARKS]

(a) (i) The three sides of a right triangle form three consecutive even numbers. Find the length of the hypotenuse in centimeters. (5 marks)

(ii) Solve for the unknowns in the system of simultaneous equations below: (4 marks)

$$x + y + z = 6$$

$$z - x + y = 4$$

$$2x - y + z = 3.$$

(b) Differentiate between Permutation and Combination. (4 marks)

(c) How many different committees of seven people can be chosen from a group of 11 if only five people qualify for presidency (4 marks)

(d) Simplify $\frac{i}{4i+1}$ leaving your answer in the form $a + bi$. (3 marks)

QUESTION FIVE [20 MARKS]

(a) Find three distinct possible numbers such that if any of the three numbers is divided by 10 the remainder is six and when divided by thirteen, the remainder is nine. (4 marks)

(b) Compute the mean and the variance of 6, 7, 10, 11, 11, 13, 16, 18, 25. (8 marks)

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

(d) Find the tenth term and the sum of the first eight terms of the geometric series 20+10+5+...(5 marks)