JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

UNIVERSITY EXAMINATION 2013

1ST YEAR 2ND SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF EDUCATION ARTS WITH IT

(S BASED KOSELE)

COURSE CODE: SMA 208

TITLE: ANALYSIS

DATE: 4/5/2013 TIME: 15.00-17.00PM

DURATION: 2 HOURS

INSTRUCTIONS

1. **This paper contains FIVE (5) questions**
2. **Answer question 1 (Compulsory) and ANY other 2 Questions**
3. **Write all answers in the booklet provided**

QUESTION 1

(a) Differentiate between infinite and a finite set. **(2mks)**

(b) Define a null set. **(1mk)**

(c) If A=(3,4) B= (2,4,6,8). Find AUB. **(2mks)**

(d) (i) Define the term neighbourhoods of a set. **(2mks)**

(ii) If M and N are neighbourhood of a point X, then show that M∩N is also a neighbourhood of X. **(6mks)**

(e) Prove that the greatest member of a set, if it exists, is the supremum (l.u.b) of the set. **(5mks)**

(f) Let A, B and S be sets of real numbers. Show that

(i) $S \subseteq \bar{S}$ (4 marks)

(ii) $A \subseteq B = \bar{A} \subseteq \bar{B}$ (4 marks)

(iii) $\bar{S}$ is always closed (4 Marks)

QUESTION 2

(a) Define

(i) Interior point of a set S. **(1mk)**

(ii) Interior of a set S. **(1mk)**

(iii) Open sets. **(2mks)**

(b) Show that every open set S is a union of open intervals. **(5mks)**

(c) Prove that interior of a set S is an open set. **(10mks)**

(d) Define a closed set S. **(3mks)**

QUESTION 3

(a) Show that for every three non-empty sets R, S, T we have

R∩(SUT) = (R∩S) U (R∩T) **(10mks)**

(b) State and prove the De Morgans Law. **(10mks)**

QUESTION 4

(a) Give the definition of limit of a function and prove that this limit is unique. **(5mks)**

(b) Define the concept of uniform continuity. Let f:IR → IR be define by $f(x) = |x|$ for all x in IR. Show that f is uniformly continuous on IR. **(5mks)**

(c) (i) Given $f(x) = x^2 - 5x$, show that limit f(x) = -6. **(2mks)**

(ii) Determine a value for δ>0 associated with ε>0 in accordance with the definition of limit of a function. **(8mks)**

QUESTION 5

(a) Define a field on a set S. **(5mks)**

(b) Let x and y be positive real numbers. Show that:

(i) x+y is also positive

(ii) $x < y$ iff $x^2 < y^2$

(iii) $x < y$ $^1/_y < ^1/_x$ **(15mks)**