JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

SCHOOL OF BIOLOGICAL, PHYSICAL, MATHEMATICS AND ACTUARIAL SCIENCES

UNIVERSITY SPECIAL EXAMINATION FOR DEGREE OF BED/BSC

COURSE CODE: SMA 208

COURSE TITLE: Introduction to Analysis

EXAM VENUE: **STREAM: (BED/BSC)**

DATE: **EXAM SESSION:**

TIME: 2.00HRS

Instructions:

1. **Answer Question one (COMPULSORY) any other TWO questions only**
2. **Candidates are advised not to write on the question paper.**
3. **Candidates must hand in their answer booklets to the invigilator while in the examination room**

QUESTION ONE [30 MARKS] (COMPULSORY)

(a) Determine $|P(P(P(P(P(\varnothing)))))|$. (5 marks)
(b). Discuss order-completeness of the complement set of irrationals. (5 marks)
(c). Analyze the significance of introduction to analysis. (5 marks)
(d). Explain assymptotic discontinuity of a function. (5 marks)
(e) Give the associativity criterion for an ordered field of real numbers. (5 marks)
(f). State and prove Bolzano-Weierstrass theorem for the set of real numbers. (5 marks)

QUESTION TWO [20 MARKS]

(a). Describe the terms: Sub-cover, Compactness and Sphere. (3 marks)
(b). Prove that a compact set B is closed. (17 marks)

QUESTION THREE [20 MARKS]

(a). Explain maximal and minimal attainability of a continuous function *f*. (2 marks)

(b). Prove that if $f: [a, b] \rightarrow \boldsymbol{R}$ is continuous then *f* is bounded and there exists points c_1 and c_2 in $[a, b]$ such that *f* attains its maximum at c_1 and its minimum c_2. (18 marks)

QUESTION FOUR [20 MARKS]

(a). Define a cluster point of a set *S* which is a subset of real numbers. (2 marks)

(b). Prove that the interior of an open set *S* is open. (8 marks)

(c). State and prove the existence of a smallest number property. (10 marks)

QUESTION FIVE [20 MARKS]

(a). Analyze closedness of the closure of a set *B*. (12 marks)

(b). Prove that the closure of a set *S* contains B. (2 marks)

(c). Prove that if the closure of a set *B* contains the closure of a set *A* then *A* is contained in *B*. (6 marks)