****

**GARISSA UNIVERSITY**

**UNIVERSITY EXAMINATION 2018/2019 ACADEMIC YEAR THREE**

**SECOND SEMESTER EXAMINATION**

**SCHOOL OF BIOLOGICAL AND PHYSICAL SCIENCES**

**FOR THE DEGREE OF BACHELOR OF EDUCATION**

**COURSE CODE: MAT 312e**

**COURSE TITLE: COMPLEX ANALYSIS 1**

**EXAMINATION DURATION: 2 HOURS**

**DATE: 05/02/2020 TIME: 09.00-11.00 PM**

**INSTRUCTION TO CANDIDATES**

* **The examination has FIVE (5) questions**
* **Question ONE (1) is COMPULSORY**
* **Choose any other TWO (2) questions from the remaining FOUR (4) questions**
* **Use sketch diagrams to illustrate your answer whenever necessary**
* **Do not carry mobile phones or any other written materials in examination room**
* **Do not write on this paper**

**This paper consists of FOUR (4) printed pages *please turn over***

**QUESTION ONE (COMPULSORY)**

1. Given the complex number and evaluate (i) (ii) (5 marks)
2. Represent in algebraic form (2 marks)
3. = and , find (1 mark)
4. Express in trigonometric form (5 marks)
5. Find the modulus and argument of (5 marks)
6. Given find and by solving the simultaneous equations

 (4 marks)

1. Show that for the complex variable (6 marks)
2. find . (2 marks)

**QUESTION TWO (20 MARKS)**

1. Find the analytic function if its real part is given as and (10 marks)
2. Use the definition of limits to show that given (7 marks)
3. Represent in algebraic form (3 marks)

**QUESTION THREE (20 MARKS)**

1. Solve the equation (4 marks)
2. Show that is a factor of when belongs to the set of
3. Integers,
4. Rational numbers,
5. Real numbers,
6. Complex numbers, (10 marks)
7. and are the roots of the quadratic equation

Express each of and in the form where and are real numbers (6 marks)

**QUESTION FOUR (20 MARKS)**

1. Express and in terms of and and hence show that (12 marks)
2. Use De Moivres’s theorem to show that (4 marks)
3. Prove that for the complex numbers and
4. (4 marks)

**QUESTION FIVE (20 MARKS)**

1. Show that if the real and imaginary parts of an analytic function have continuous second order partial derivatives, then they satisfy the Laplace equation: (11 marks)
2. Prove that is harmonic (9 marks)