

**NATIONAL OPEN UNIVERSITY OF NIGERIA**

JABI, ABUJA

FACULTY OF SCEINCES

DEPARTMENT OF PURE AND APPLIED SCIENCE

**JANUARY/FEBRUARY 2018 EXAMINATION**

**COURSE CODE: PHY 313**

**COURSE TITLE: MATHEMATICAL METHODS FOR PHYSICS II**

**TIME ALLOWED: (3 HRS)**

**INSTRUCTION: Answer ONE and any other four (4) questions**

**QUESTION 1**

* 1. Prove that the sufficient condition for a function to be analytic at all points in a region R are

(8 Marks)

Are continuous functions of x and y in R.

* 1. Use the Cauchy-Rieman equation to show that is analytic in the entire z-plane. (7 Marks)
  2. Test the analyticity of the function and hence show that.

(7 Marks)

**QUESTION 2**

a. Show that the real and imaginary parts of satisfy the Cauchy-Rieman equations. (4 Marks)

b. Derive the polar form of the Cauchy-Rieman equations. (4 Marks)

c. Prove that for any analytic function, both and are harmonic. (4 Marks)

**QUESTION 3**

a. If represents the complex potential of an elective field and determine the function Ø. (4 Marks)

b. if is analytic and find the in terms of z. (4 Marks)

c. Let be an analytic function. If , construct the corresponding analytic function in terms of z. (4 Marks)

**QUESTION 4**

Determine the poles and the Residues at each pole of the following functions

a.

b.

c. at only

**QUESTION 5**

a. Find the value of the integral

* + 1. 5ai Along the straight path from to (4 Marks)
    2. 5aii Along the real axis from to and then along a line parallel to the imaginary axis from to (3 Marks)

b. Using Cauchy’s integral theorem, find the value of

If C is the circle (5 Marks)

**QUESTION 6**

a. where C is the ellipse (4 Marks)

b. where C is (4 Marks)

c. where C is (4 Marks)