



NATIONAL OPEN UNIVERSITY OF NIGERIA
PLOT 91, CADASTRAL ZONE, NNAMDI AZIKIWE EXPRESSWAY, JABI - ABUJA
FACULTY OF SCIENCES

DEPARTMENT OF PHYSICS

2024 1 EXAMINATION

COURSE CODE: PHY 313
COURSE TITLE: MATHEMATICAL METHODS FOR PHYSICS II
CREDIT UNIT: 3
TIME ALLOWED: (3 HRS)

INSTRUCTION: *Answer question 1 and any other THREE questions*

QUESTION 1

- (A) Solve the complex number
- (i) $(2 + 3i) + (4 + 7i)$ [3marks]
(ii) $(2 + 3i)(4 + 7i)$ [3marks]
- (B) Established the analyticity of the following complex variable
- (i) $|z|$ [4marks]
(ii) $\text{Re}(z)$ [4marks]
- (C) Evaluate $z = (1 + i\sqrt{3})^8 + (1 - i\sqrt{3})^8$ [11marks]

QUESTION 2

- (A) Given the complex function $U(x, y) = x^2 + 2axy + by^2$. Find a and b
[9marks]
- (B) Test if the function $1/z$ is analytic [6marks]

QUESTION 3

- (A) Given the complex function $w = \sin z$, obtain the real complex part of $\frac{dw}{dz}$ [7marks]
- (B) Using Cauchy integral, Solve $\int_c \frac{\cos Z}{Z - \pi}$ [8 marks]

QUESTION 4

- (A) Explain the concept of monogenic function [3marks]
- (B) Given that a function $f(z) = U(x, y) + iV(x, y)$ is analytic in domain D and $U(x, y) = x^4 - 6x^2y^2 + y^4$. Determine the harmonic conjugate of $U(x, y)$ [12marks]