NATIONAL OPEN UNIVERSITY OF NIGERIA
University Village, Plot 91, Cadastral Zone, Nnamdi Azikwe Express Way, Jabi, Abuja
FACULTY OF SCIENCES
DEPARTMENT OF MATHEMATICS
2022_2 Examinations

Course Code: MTH381
Course Title: MATHEMATICAL METHODS III
Credit Unit: 3
Time Allowed: 3 Hours
Total: 70 Marks
Instruction: Answer Question One (1) and Any Other 3 Questions

Q1(a) if $z_1 = 9 - 8i$ and $z_2 = 5 + 2i$. Find $\frac{z_1}{z_2}$ **(5 marks)**

(b) Find $\int_0^2 \int_0^1 (x^2 + y^2) dydx$ **(5 marks)**

(c) State the Cauchy's Integral theorem. **(5 marks)**

(d) (i) Evaluate $\int_0^{1+i} z^2 dz$ **(5 mark)**

(ii) Find the residue at the second order pole of $f(z) = \frac{50z}{(z+4)(z-2)^2}$ **(5 marks)**

Q2 (a) Suppose $f(x, y) = x^2 - 4xy + 8y$, find $f(2,3)$ **(7 marks)**

(b) Evaluate $\int_{-2}^2 \int_0^z \int_{x-z}^{x+z} (x + y + z) dydxdz$ **(8 marks)**

Q3 (a) Define each of the following:

i) a scalar function **(3 marks)**
ii) a differentiable vector function **(4 marks)**

(b) If $A = (3x^2 + 6y)i - 14yzj + 20xz^2k$, evaluate $\int_C A \cdot dr$ from (0,0,0) to (1,1,1).

(8 marks)

Q4 (a) Define each of the following:

(i) derivative of a complex function **(4 mark)**

(ii) a differentiable complex function at a point **(4 marks)**

(b) i. Define a stationary steady- state vector field. **(3 marks)**

ii. What is the relationship between vector field and vector functions? **(4 marks)**

Q5 (a) (i)State the Cauchy's Integral theorem. **(3 marks)**

(ii) Moreras's theorem. **(4 marks)**

(b) (i) Evaluate $\int_0^{1+i} z^2 dz$ **(4 mark)**

(ii) Find the residue at the second order pole of $f(z) = \frac{50z}{(z+4)(z-1)^2}$ **(4 marks)**

Q6 (a) Suppose $f(x, y) = x^2 - 3xy + 6y$, find $f(2,3)$ **(7 marks)**

(b) Evaluate $\int_{-1}^{1} \int_0^z \int_{x-z}^{x+z} (x + y + z) dy dx dz$ **(8 marks)**