



NATIONAL OPEN UNIVERSITY OF NIGERIA
Plot 91, Cadastral Zone, Nnamdi Azikiwe Expressway, Jabi, Abuja

FACULTY OF SCIENCES
April/May Examination 2019

Course Code: MTH305
Course Title: Complex Analysis II
Credit Unit: 3
Time Allowed: 3HOURS
Total: 70 Marks
Instruction: ATTEMPT QUESTION NUMBER ONE AND ANY OTHER FOUR (4) QUESTIONS

1. (a) Find the value of $\oint_c \frac{\sin^6 z}{(z - \pi/6)^3}$ where c is a circle $|z| = 1$ (8 Marks)
- (b) If C is the curve $y = x^3 - 3x^2 - 4x - 1$ joining the point $(1,1)$ and $(2,3)$, show that $\oint (12z^2 + 4iz) dz$ is independent of the path joining $(1,1)$ and $(2,3)$ (8 Marks)
- (c) Suppose that $f(z) = z^2$ at any point z , find the derivative of $f(z)$. (6 Marks)
2. Find the value of the integral $I_1 = \int_{C_1} z^2 dz$ where C_1 is the line segment from $z=0$ to $z = z + i$ (12 marks)
3. For each of the following functions, determine the pole and the residues at the pole.
 - (a) $\frac{2z+1}{z^2-z-2}$ (6 Marks)
 - (b) $\left(\frac{z+1}{z-1}\right)^2$ (6 Marks)
4. (a) Prove that $\cosh^2 z - \sinh^2 z = 1$ (8 Marks)
- (b) Define absolute convergence of a series (4 Marks)
5. Expand $f(z) = \cos z$ in Taylor series about $z = \frac{\pi}{4}$ and determine its region of convergence (12 marks)
6. (a) Expand $f(z) = \frac{z}{(z-1)(z-2)}$ in Laurent series valid for $|z| < 1$ (8 marks)
- (b) Define derivative of a function. (4 marks)