NATIONAL OPEN UNIVERSITY OF NIGERIA

Plot 91, Cadastral Zone, Nnamdi Azikwe Expressway, Jabi, Abuja.

FACULTY OF SCIENCES
DEPARTMENT OF MATHEMATICS

2023_2 EXAMINATIONS

Course Code: MTH 382
Course Title: Mathematical Methods IV
Credit Unit: 3
Time Allowed: 3 Hours
Instruction: Answer Number One (1) and Any Other (4) Questions

1. (a) Use fractional notation to show that $(\alpha)_{2n} = 2^{2n}\left(\frac{\alpha}{2}\right)_n\left(\frac{\alpha+1}{2}\right)$ **(6 Marks)**

   (b) We prove that $\Gamma z = \lim_{m\to w}[\int_0^x [e^{-t} - \left(1-\frac{t}{n}\right)^R]t^{z-1}dt$ **(16 Marks)**

2. Define the norm of differential equation on R^n and show the $f^1(x) = F[x, f(x)], f(x_0) = y_0$ has unique solution. **(12 Marks)**

3. (a) Why do we impose boundary conditions? **(3 Marks)**

   (b) Show that $\Gamma(2z) = \frac{2^{2z-1}}{\sqrt{\Pi}}\Gamma(z)\Gamma\left(z+\frac{1}{2}\right), 2z = 0, -1, -2, \ldots\ldots)$ **(9 Marks)**

4. Show that if)$R(p) > 0, R(q) > 0$, $B(p,q) = \frac{r(p)r(q)}{r(p+q)}$ **(12 Marks)**

5. (a)State the telegraphic equation (3Marks)

   (b) When do we say a function is periodic? (3 Marks)

   (c) Express the validity of Fourier's series in the interval $-c \le x \le c$. **(3 Marks)**

   (d) Explain Ordinary Differential Equation as a functional equation **(3Marks)**

6. Prove that $\Gamma(Z) = \frac{Lim}{n \to w}\int_0^x \left(1-\frac{t}{n}\right)^n t^{z-1}dt$

   (12 Marks)