NATIONAL OPEN UNIVERSITY OF NIGERIA
Plot 91, Cadastral Zone, Nnamdi Azikwe Expressway, Jabi, Abuja
FACULTY OF SCIENCES
DEPARTMENT OF MATHEMATICS
September Examination, 2020_1

Course Code: MTH382
Course Title: Mathematical Methods IV
Credit Unit: 3
Time Allowed: 3 Hours
Instruction: Answer Number One (1) and Any Other (4) Questions

1. Prove the uniqueness of the function $f(x)$ on R' to R^n defined for $|x - x_o| < r$ where

   $$r < min(a, \frac{b}{M})$$ **(22 marks)**

2. (a) Show that $r(z)r(1-z) = \frac{\pi}{\sin \pi z}$ for $z \neq 0,1,2$ **(8 marks)**

   (b) Prove that $(\alpha)_n = \frac{r(\alpha + n)}{r(\alpha)}$ **(4 marks)**

3. Show that if $R(c - a - b) > 0$ and if c is neither zero nor a negative integer

   $$2F_1(a,b,c) = \frac{r(c)r(c-a-b)}{r(c-a)r(c-b}$$ **(12 marks)**

4. Prove that

   If $1 \leq 1 \leq 1$ and $R(c) > R(b) > 0$ then $2F_1(a,b,c,z) = \frac{r(c)}{r(b)r(c-b)} \int_0^1 t^{b-1}(1-t)^{c-b-1}(1-tz)^{-c_1} dt$

   (12 marks)

5. Given that $x^2 \frac{d^2 y}{dx^2} + x \frac{dy}{dx} + (x^2 - v^2)y = 0$, Where x=0, Assume that v is not an integer,

   $$y = \sum_{n=1}^{\infty} c^m x^{m+r}$$ **(12 marks)**

6. Prove that $\int_0^{\frac{\pi}{2}} J_o z(\cos\theta)\cos\theta d\theta = \frac{\sin Z}{Z}$ **(12 marks)**