



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

FACULTY OF SCIENCES
April/May Examination 2019

Course Code: MTH422
Course Title: Partial Differential Equations
Credit Unit: 3
Time Allowed: 3 HOURS
Total: 70 Marks
Instruction: ATTEMPT NUMBER ONE AND ANY OTHER FOUR (4) QUESTIONS

1.(a) Define a single relation between u and v (4 Marks)

(b) Find the general solution of $xp + yq = z$ (9 Marks)

(c) Solve $z = px + qy + f(p, q)$ (9 Marks)

2. Find the general solution of

$$(y + 2x)p - (x + 2yz)q = \frac{1}{2}(x^2 - y^2)$$

$$x \in R: y > 0 \quad (12 \text{ Marks})$$

3. Solve that $z(x, 0) = \begin{cases} 1 - x^2, & |x| \leq 1 \\ 0, & |x| > 1 \end{cases}$

$$z(x, y) = F(x - cy) = 1 - (x - cy)^2 \quad \text{Unique solution} \quad (12 \text{ Marks})$$

$$z(x, y) = F(n - cy) = 0 \quad \text{infinitely many}$$

4. Given $F(p, q) = 0$ Solve $p^2 - q^2 = 1$ (12 Marks)

5. Show that $z \frac{\partial^2 u}{\partial x \partial y} + 2x \frac{\partial^2 u}{\partial y \partial z} = 0$ is hyperbolic parabolic in R^3 . (12 Marks)

6. Solve the IVP

$$u_t + a(u)u_x = 0 \quad (12 \text{ Marks})$$

$$u(x, 0) = f(x)$$