



NATIONAL OPEN UNIVERSITY OF NIGERIAN
Plot 91, Cadastral Zone, Nnamdi Azikiwe Express Way, Jabi-Abuja
FACULTY OF SCIENCES
January\February Examination 2018

Course Code: MTH421
Course Title: Ordinary Differential Equations
Credit Unit: 3
Time Allowed: 3Hours
Total Marks: 70%

**INSTRUCTION: ANSWER QUESTION ONE(1) AND ANY FOUR (4)
QUESTIONS (TOTAL = 5 QUESTIONS IN ALL)**

1(a) Define the following with examples;

- (i) Ordinary Differential Equation **(2marks)**
- (ii) Partial Differential Equation **(2marks)**
- (iii) First Order Differential Equation **(2marks)**

1(b) Write the general form of the following equations:

- (i) Bernoulli **(2marks)**
- (ii) Second order Ordinary Differential Equation **(2marks)**
- (iii) Linear Ordinary Differential Equation **(2marks)**

1(c) When is a function $\phi(t)$ said to be a solution of the initial value problem: $y' = f(x, t), y(t_0) = y_0$ **(4marks)**

1(d) Define a principal fundamental matrix for the system $x' = A(t)x$ **(4marks)**

1(e) When does a function said to be homogeneous? **(2marks)**

2(a) State the Gronwall's inequality **(4marks)**

2(b) Solve $x \frac{dy}{dx} + y = x^2 y^2$, a Bernoulli equation **(8marks)**

3(a) Show whether or not the equation: $\cos(x+y)dx + (3y^2 + 2y + \cos(x+y))dy = 0$ is exact
(4marks)

3(b) Solve the initial value problem by finding the integrating factor to the non-exact equation:
 $(e^{x+y} + ye^y)dx + (xe^y - 1)dy = 0$ $y(0) = -1$
(8marks)

4(a) Define the convergence of a sequence
(4marks)

4(b) Obtain the Wronskian of the equation: $y'' - 4y' + 4y = 0$
(8marks)

5(a) Define Linear Equation
(4marks)

5(b) Solve $\frac{dp}{dt} = p - p^2$
(8marks)

6(a) Define a principal fundamental matrix for the system $x' = A(t)x$
(4marks)

6(b) State the Existence Theorem and list the four important steps to prove this theorem
(8marks)