NATIONAL OPEN UNIVERSITY OF NIGERIA
14/16 AHMADU BELLO WAY, VICTORIA ISLAND, LAGOS
SCHOOL OF SCIENCE AND TECHNOLOGY
MARCH/APRIL 2014 EXAMINATION

COURSE CODE: MTH421
COURSE TITLE:ORDINARY DIFFERENTIAL EQUATION
TIME ALLOWED: 2 ½ HOURS
INSTRUCTION: QUESTION ONE IS COMPULSORY. ANSWER ANY OTHER FOUR.

1.a) When will a set of points A of the xy plane said to be **CONNECTED**? 3marks

b) When is a set of points A of the xy plane said to be **OPEN?** 3marks

c) what do you call an **OPEN** and **CONNECTED** set in the xy plane? 2.5marks

d) when is a point P said to be a **BOUNDARY POINT** of a domain D? 3marks

e) what will you call a **DOMAIN PLUS** its **BOUNDARY POINTS**?2.5marks

2a Solve the differential equation. $2xy\frac{dy}{dx}=y^2-x^2.$ 7marks

b. Solve the initial valued problem $\frac{d^2y}{dx^2}+\frac{dy}{dx}+36.09\,y=0,$ $y(0)=0, and \frac{dy(0)}{dx}=3$ 7marks

$$\left(e^{x+y}+ye^{y}\right)dx+\left(xe^{y}=1\right)dy=0\ldots\ldots\ldots y(0)=1$$

3. Giving the initial value problem

a) Does the Initial Value Problem EXIST? Otherwise go to question 3b.

3marks

b) Find the Integrating Factor

5marks

c) Solve the initial value problem completely

7marks

4a. Solve the ODE.

$$\frac{d^2y}{dx^2}+\frac{dy}{dx}-56\,y=0.$$
$$y(0)=4,\,and\,\frac{dy(0)}{dx}=-5$$

4b. Solve the initial value problem

7marks

$$\frac{d^2y}{dx^2}-6\frac{dy}{dx}+25\,y=0,$$
$$y(0)=-3,\,and\,\frac{dy(0)}{dx}=-1$$

7marks

5.Solve the initial value problem

$$\frac{d^2y}{dx^2}+2\frac{dy}{dx}+5y=e^{5x}+40\cos 10x-190\sin 10x.$$

$$y(0)=0.16, and \frac{dy(0)}{dx}=40.08$$

14marks

$$\frac{d^3y}{dx^3}-2\frac{d^2y}{dx^2}-\frac{dy}{dx}+2y=0$$

6a. .Solve the equation

10marks

b. Show that the solution to question [6a] are linearly independent . 6

4marks

7. Solve the ODE using Laplace transform methods

$$\frac{d^3y}{dx^3}-3\frac{d^2y}{dx^2}+2y=2e^{-x}$$

subject to the boundary conditions $y(0)=2$ and $y'(0)=1$

14marks