NATIONAL OPEN UNIVERSITY OF NIGERIA
14-16 AHMADU BELLO WAY, VICTORIA ISLAND, LAGOS
SCHOOL OF SCIENCE AND TECHNOLOGY JANUARY/FEBRUARY 2013 EXAMINATION

CODE: **MTH 302** **TIME: 3 HOURS**
TITLE: **ELEMENTARY DIFFERENTIAL EQUATION II** **TOTAL: 70 MARKS**
CREDIT UNIT: **3**
INSTRUCTION: **ANSWER ANY 5 QUESTIONS**

1. (a) Find the solution of the initial value problem

$$4\frac{d^2y}{dx^2}-8\frac{dy}{dx}+3y=0, y(0)=2, y'(0)=\frac{1}{2}$$

6 marks

(b) Solve the differential equation $y"+y=0$ **near the ordinary point** $x=0$ **8 marks**

2.(a) Prove that (i) $B(m,n)=2\int_0^{\frac{\pi}{2}}\sin^{2m-1}\theta\cos^{2n-1}\theta d\theta$

8 marks

(b) Find the particular solution of $\frac{d^2y}{dx^2}-3\frac{dy}{dx}-4y=3e^{2t}$ **6 marks**

3.(a) Find the general solution of $y'''-3y''+3y'-y=4e^t$ **7 marks**

(b) Solve the differential equation $y"+(x-1)^2y'-4(x-1)y=0$ **about the ordinary point** $x=1$ **7 marks**

4.(a) Construct the Fourier series over the interval $-2\le x\le 0$ **for the function defined by**

$$f(x)=\begin{cases}2 & -2\le x\le 0\\ x & 0<x<2\end{cases}$$

7 marks

(b) Find the general solution of the differentialequation

$$4x\frac{dy^2}{dx^2}+6\frac{dy}{dx}+y=0$$

7 marks

5.(a) Find a series solution in powers of Airy's equation

$y''-xy=0, -\infty<x<\infty$ **7 marks**

(b) Solve differential equation $y"+2y'-3y=9x; \quad y(0)=1, y'(1)=2.$ **-7 marks**

6.(a) Find a Fourier sine series for $f(x)=\begin{cases}0 & x\le 2\\ 2 & x>2\end{cases}$ **on** $(0,3)$ **-7 marks**

(b) Solve the differential equation $x^2y''+3xy+(1-2x)y=0$ **-7 marks**

7.(a) Solve the differential equation $y''-y'-2y=\cos 2x$ **-7marks**

(b) Show that $2x^2y''-xy'+(1+x)y=0$ **is regular singular and solve using power series solution**