NATIONAL OPEN UNIVERSITY OF NIGERIA
14-16 AHMADU BELLO WAY, VICTORIA ISLAND LAGOS
SCHOOL OF SCIENCE AND TECHNOLOGY
MAY/JUNE 2012 EXAMINATION

MTH 302 ELEMENTARY DIFFERENTIAL EQUATION II
TIME: 3 HOURS

TOTAL: 70 MARKS
CREDIT UNIT: 3INSTRUCTION: ANSWER ANY 5 QUESTIONS

1. (a) Solve the differential equation $y"+y=0$ near the ordinary point $x=0$ - 10 marks

(b) Solve the differential Euler equation $x^2y"+x\alpha y'+\beta y=0$ - 4 marks

-8 marks

2.(a) Prove that (i) $B(m,n)=2\int_0^{\frac{\pi}{2}}\sin^{2m-1}\theta\cos^{2n-1}\theta d\theta$ -6 marks

(ii) $B(3,2)$ -2 marks

(b) Solve the differential equation $(1-x^2)y"-6xy'-4y=0$ near the ordinary point $x=0$ - 6marks

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

4.(a) Find the series solution of the equation $xy"-(4+x)y'+2y=0$ -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 the series solution of the equation $xy"+(1+x)y'-2y=0$ -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 $y"-y'-2y=\sin 2x$ -7marks

(b) Find the eigenvalues and eigenfunctions of $y"-4\lambda y'+4\lambda^2 y=0;$
$y(0)=0, \quad y(1)+y'(0)=0$ -7 marks