OLABISI ONABANJO UNIVERSITY, AGO-IWOYE
DEPARTMENT OF MATHEMATICAL SCIENCES
B.Sc. DEGREE EXAMINATIONS (200LEVEL)
RAIN SEMESTER 2013/2014

MAT202: ELEMENTARY DIFFERENTIAL EQUATIONS

INSTRUCTION: ANSWER ALL QUESTIONS. TIME ALLOWED: 2HRS

MATRIC. NO. .... YOUR DEPARTMENT..

SURNAME.............................. OTHER NAMES..

1. What is "order" of a differential equation?

2. Write an example of a nonlinear ordinary differential equation.

3. Find the differential equation satisfied by $y = e^x(c_1 + c_2x)$ by differentiating twice and eliminating the constants c_1 and c_2.

4. Given one solution of $x^2y'' + xy' - 4y = 0$ as $y_1 = x^2$, find a second solution y_2 such that $y_2 = v(x)y_1$.

5. Let $y_1 = e^x \sin x$ and $y_2 = \cos x$ be two solutions of a second order ordinary differential equation. Find the Wronskian.

6. Solve the equation $\frac{d^2y}{dx^2} + \left(\frac{dy}{dx}\right)^2 = 0$

Hamdalat

Solve the differential equations 7 – 11; say the method used in each case

7. $(1 - y^2)dx + (1 - x^2)dy = 0$

8. $x\dfrac{dy}{dx} + (1 - x)y = xe^x$

9. $(3x^2y + y^2 + 1)dx + (x^2 + 2xy - 1)dy$.

10. $(x + y)dy = (x - y)dx$

11. $xy' + y = x; \quad y(1) = 2$

12. Find the general solution of $y'' - 2y' + 3y = 0$.

13. Solve $y'' - 6y' + 9y = 0, \quad y(0) = 2, \quad y'(0) = 4$

14. Use the method of undetetrmined coefficients to find the complete solution of $y'' - 3y' + 2y = e^x + x$

15. Solve $y'' + y' - 2y = 3e^x$ by methode of variation of parameters.

16. $\frac{d^2y}{dx^2} + \lambda^2 y = 0; \quad y(0) = 0, \quad y(\pi) = 0;$

MATRIC. NO. .... DEPARTMENT..

17. Find the solution of the set of equations

$$2\frac{dx}{dt} = 3x - y$$

$$2\frac{dy}{dt} = 3y - x$$

18. By substituting $y = u/\sqrt{x}$ in the equation $x^2y'' + xy' + (x^2 - n^2) = 0$ obtain the equation $u'' + q(x)u = 0$. What is $q(x)$ as $x \to \infty$?

19. Change the variable $z = 1/y^2$ in the equation $xy' + y = x^4y^3$. Hence obtain the solution.

20. The gradient of a curve at any point (x,y) on the curve is directly proportional to the product of x and y. The curve passes through the point (1,1) and at this point the gradient of the curve is 4. Form the differential equation in x and y and solve this equation to express y in trems of x.