

CHUKA



UNIVERSITY

UNIVERSITY EXAMINATIONS

EXAMINATION FOR THE AWARD OF DIPLOMA IN

MATH 0314: ORDINARY DIFFERENTIAL EQUATIONS

STREAMS: DIP

TIME: 2 HOURS

DAY/DATE:

INSTRUCTIONS: ANSWER QUESTION ONE (COMPULSORY) AND ANY OTHER TWO QUESTIONS

1. (a) Show that $y = \ln x$ is a solution of $xy'' + y' = 0$ [3 marks]
- (b) Find the solution of $y' + y = 0$, $y(3) = 2$ if the general solution to the differential equation is known to be $y(x) = y(3) = 2, c_1 e^{-x}, c_1$ is an arbitrary constant. [3 marks]
- (c) Eliminate the arbitrary constants C_1 and C_2 from $y = C_1 e^{-2x} + C_2 e^{3x}$ [8 marks]
- (d) Solve the differential equation $(x + \sin y) dx + (x \cos y - 2) dy = 0$ [10 marks]
- (e) Solve $(y^2 - y)dx + xdy = 0$ [6 marks]
2. (a) Find the orthogonal trajectory of the family of the curve $x^2 + y^2 = cx$ [8 marks]
- (b) Solve $y'' + 4y' + 5y = 0$ [6 marks]
- (c) Solve $y'' - y' - 2y = e^{3x}$ [6 marks]
3. (a) Solve the differential equation $y'' + y' \sec x$ [10 marks]
- (b) Determine whether $x = 1$ and $x = 2$ is an ordinary point of the differential equation $(x^2 - 4)y'' + y = 0$ [10 marks]
4. (a) Find the solution near $x = 0$ of the differential equation $y'' - xy + 2y = 0$ [10 marks]
- (b) Determine whether $x = 1$ and $x = 2$ is an ordinary point of the differential. [10 marks]

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5. (a) Solve $Y'' - y' - 2y = e^{3x}$ for variable parameters where $y_n = n^2 - n - 2 = 0$
[10 marks]

(b) Solve $y' = \frac{2xye^{(x/y)^2}}{y^2 + ye^{(x/y)^2} + 2x^2e^{(x/2)^2}}$ [10 marks]
