ALUPE UNIVERSITY COLLEGE
...Bastion of Knowledge...
P. O.Box 845-50400 Busia(K)
principal@auc.ac.ke
Tel: +254 741 217 185
+254 736 044 469
off Busia-Malaba road

OFFICE OF THE DEPUTY PRINCIPAL

ACADEMICS, STUDENT AFFAIRS AND RESEARCH

UNIVERSITY EXAMINATIONS

2020 /2021 ACADEMIC YEAR

THIRD YEAR SECOND SEMESTER REGULAR EXAMINATION

FOR THE DEGREE OF BACHELOR OF EDUCATION SCIENCE & BACHELOR OF EDUCATION ARTS

COURSE CODE: **MAT 304E**

COURSE TITLE: **ORDINARY DIFFERENTIAL EQUATIONS II**

DATE: 16/7/2021 **TIME: 0800-1100HRS**

INSTRUCTION TO CANDIDATES

- **SEE INSIDE**

THIS PAPER CONSISTS OF 3 PRINTED PAGES **PLEASE TURN OVER**

REGULAR - MAIN EXAM

MAT 304: ORDINARY DIFFERENTIAL EQUATIONS II

STREAM: EDS & EDA **DURATION: 3 Hours**

INSTRUCTIONS TO CANDIDATES

i. Answer **ALL** questions from **Section A** and any Three from **Section B**

ii. Do not write on the question paper.

SECTION A: 31 MARKS (COMPULSORY SECTION)

Question One (16 Marks)

a) Classify the singular points , in the finite plane of the equation
$x(x-1)^2(x+2)y''+x^2y'-(x^3+2x-1)y=0$ (4 Marks)

b) Solve the system of equations $y_1'-2y_1+2y_2'=2-4e^{2x}, 2y_1'-3y_1+3y_2'-y_2$ (7 Marks)

c) Given the initial- value problem $y'=-x, y(0)=2.$ Show that there is a unique solution, hence find the solution. (6 Marks)

Question Two (15 Marks)

a) Show that $y_1=x$ is a solution of $2x^2y''+xy'-y=0$ (3 Marks)

b) Use the method of reduction of order to find a second linearly independent solution of the differential equation in (a) and write the general solution. (9 Marks)

c) Solve the Boundary –Value Problem $y''+y=0, y(0)=0, y(\pi)=0$ (3 Marks)

SECTION B (Answer any Three Questions)

Question Three (13 Marks)

Solve the differential equation $y''+2y'=3x$. Using the method of reduction of order to find a y_p (13 Marks)

Question Four (13 Marks)

a) Given the Initial-Value Problem $y'=-x, y(0)=2$. Show that there is a unique solution, hence find the solution. (9 Marks)

b) Find a solution of the Initial-Value Problem $\frac{dy}{dx}=x^2; x_0=2, y_0=1$ (4 Marks)

Question Five (13 Marks)

a) Solve the differential equation $xp^2-(2x+3y)p+6y=0$ (7 Marks)

b) Solve the differential equation $(x^2-1)p^2-2xyp+y^2-1=0$ by breaking it up into two equations of Clairaut's form. (6 Marks)

Question Six (13 Marks)

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

Question Seven (13 Marks)

a) Given $y=\frac{c+n}{c(c+1)(c+2)\ldots(c+n-1)}$ find $\frac{dy}{dc}$. (3 Marks)

b) Obtain two linearly independent solutions valid near the origin of the equation

$$2xy''+(1+x)y'-2y=0 \quad .$$ (10 Marks)