(Knowledge for Development)

KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS

2017/2018 ACADEMIC YEAR

THIRD YEAR FIRST SEMESTER

MAIN EXAMINATION

FOR THE DEGREE OF BACHELOR OF EDUCATION AND BACHELOR OF SCIENCE

COURSE CODE: MAT 321

COURSE TITLE: ODE I

DATE: 16/01/18 **TIME:** 9 AM -11 AM

INSTRUCTIONS TO CANDIDATES

Answer Question One and Any other TWO Questions

TIME: 2 Hours

This Paper Consists of 3 Printed Pages. Please Turn Over.

QUESTION ONE (30 MARKS)

a) Find the solution of the homogeneous differential equation

$\frac{dy}{dx} = \frac{y^2 - x^2}{2xy}$ [5 marks]

b) Solve the linear fractional equation

$(x - y - 1)dy = (x + y - 3)dx$ [5 marks]

c) List the types of 1st order differential equations [2 marks]

d) Solve the 2nd order differential equation

$\frac{d^2y}{dx^2} + y = 0$ [4 marks]

e) Solve the non-homogeneous differential equation

$\frac{d^2y}{dx^2} + 5\frac{dy}{dx} + 6y = 3e^{2x}$ [6 marks]

f) Solve the initial value problem

$y'' - 3y' + 2y = 3e^{-x} - 10cos3x \quad y(0) = 1, y'(0) = 2$ [8 marks]

QUESTION TWO[20 MARKS]

a) Solve the differential equation

$(x^2 + y^2)dx + 2xydy = 0$ [5 marks]

b) Find the general solution of

$y^{(4)} + y^{(3)} + y'' + y' = 0$ [6 marks]

c) State the form for a non-homogeneous 2nd order differential equation with constant coefficient [2 marks]

d) A thermometer reading 100^0 F is placed in a pan of oil maintained at 10^0 F.

What is the temperature of the thermometer when t=10 sec if its temperature is 60^0 F when t=4 sec? [7 marks]

QUESTION THREE [20 MARKS]

a) Solve the system

$y_1' - y_2 = x^2$

$y_2' + 4y_1 = x$ [8 marks]

b) Solve $(xy - y^2)dx - (x^2 - 2xy)dy = 0$ [6 marks]

c) State the order and degree of the following differential equations

i) $x^2dy + ydx = 0$ [3 marks]

ii) $(\frac{d^3y}{dx^3})^4 - (\frac{d^2y}{dx^2})^5 + x = 0$ [3 marks]

QUESTION FOUR [20 MARKS]

Verify that $y_1 = x^2$ and $y_2 = x$ are solution of homogeneous equation

$$x^2y'' - 3xy' + 3y = 0$$

Using this fact and applying the method variation of parameters obtain the general solution of the non-homogeneous equation

$x^2y'' - 3xy' + 3y = 6x^4$.

Compute the solution satisfying the condition when $x = 1, y = 1\ and\ y' = 1$ [20 marks]

QUESTION FIVE [20 MARKS]

(a) solve the non-homogeneous equation $\frac{dy}{dy} = \frac{x+y-2}{x-y+4}$ [11Mks]

(b) Find the general solution of $y'' - y' - 6y = 6x^3 + 26sin2x$ [9 marks]