

**W1-2-60-1-6**

## JOMO KENYATTA UNIVERSITY

**OF**

**AGRICULTURE AND TECHNOLOGY**

# University Examinations 2013/2014

**SECOND YEAR SECOND SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE**

**SMA 2231 : DIFFERENTIAL EQUATIONS**

**DATE: DECEMBER 2013 TIME: 2 HOURS**

**INSTRUCTIONS: ANSWER QUESTION ONE (COMPULSORY) AND**

**ANY OTHER TWO QUESTIONS.**

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**QUESTION ONE (30 MARKS)**

(a) Differentiate between the order of a differential equation and the degree of a differential equation and in each case give an example.

[4 marks]

(b) Find the appropriate change in volume of a cylinder if the radius is changed from 3cm to 3.01cm and the height from 5cm to 4.98cm.

[5 marks]

(c) Show that Zxy = Zyx if the function z = 3x2y – 4xy4. [6 marks]

(d) Determine the degree of the following homogeneous function:

 [3 marks]

(e) Define an ordinary differential equation and hence show that

y = ex + ce2x is a solution of y1 = 2y – ex. [5 marks]

(f) Determine all the singular points of the equation

(x – 1)  + x +y = 0 [3 marks]

(g) Solve the following equations using the method of separation of variables: 2ydy – (x2+1)dx = 0 [4 marks]

**QUESTION TWO (20 MARKS)**

(a) Prove that the equation below is an exact equation and hence solve it: [y+cos y] dx + [x+lnx – x sin y] dy = 0 [5 marks]

(b) Given that y=vx and = v + x  solve the following differential

equation: x(x+y) dy – y2 dx = 0 [7 marks]

(c) Determine the differential equation associated with

y = c1e2x + c2e-2x + c3ex [4 marks]

(d) Solve the following equation:

 + 5+ 6y = 0 [4 marks]

**QUESTION THREE (20 MARKS)**

(a) Solve the following Bernoulli equation:

x+ y = x3y6 [7 marks]

(b) Solve the following system of linear differential equations:

[5 marks]

 + + 2x + y = 0

+ 5x + 3y = 0

(c) Using the method of separation of variables, solve

= (1 + e-x)(y2+1) [5 marks]

**QUESTION FOUR (20 MARKS)**

(a) Differentiate between an ordinary point and a singular point.

[2 marks]

(b) Use the power series method to solve the differential equation:

(1-x2) -6x-4y = 0; near the ordinary point. [11 marks]

(c) Differentiate between a linear and a non-linear differential equation and give an example for each case. [4 marks]

(d) Find  given that z = f(x,y) = x2 + 2xy + 4y2 and y = eax.

[3 marks]