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**University Examinations 2014/2015**

SECOND YEAR, FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF COMPUTER SCIENCE

**SMA 2304: ORDINARY DIFFERENTIAL EQUATIONS I**

**DATE: DECEMBER 2014 TIME: 2 HOURS**

**INSTRUCTIONS:** *Answer question* ***one*** *and any other* ***two*** *questions*

**QUESTION ONE (30 MARKS)**

1. **(**i**)** Explain what is meant by the term, solution of a differential equation (2 marks)

(ii) State the order and degree of the differential equation (2 marks)

$y$-

1. (i) Find the equation of the curve which satisfies the equation (4 marks)

 $xy = (1$+$x^{2}$)$\frac{dy}{dx}$ and passes through the point $(0,1)$

 (ii) The current in an electric circuit is given by the equation $Ri + L$=0

 where L and R are constants. Show that $i$=, given that $i$ =1 when t=0

(4 marks)

1. (i) Consider the differential equation show that are linearly

independent solution of this equation on the interval -$\infty <x<\infty $ hence write the general solution of the equation (5 marks)

(ii) Show that for a differential equation of the form M(x,y) dx + N(x,y) dy =0 to be exact, then the necessary and sufficient condition is $\frac{∂m}{∂y}=\frac{∂N}{∂x}.$ Hence find the solution of the equation $ (6xy+2y^{2}-5$)$ dx+(3x^{2}+4xy-6)dy=0$ (8 marks)

1. solve the equation  (5 marks)

**QUESTION TWO (20 MARKS)**

1. Using a suitable substitution, solve the following differential equations
2. (x3+y3)dx-3xy2dy=0 (4 marks)
3.  (6 marks)
4. (i) Using an integrating factor find the solution of the differential equation. (5 marks)



(ii)The equation represents a current i flowing in an electric circuit

containing resistance R, inductance L and capacitance C connected in series. if R=200 ohms, L=0.20 Henry and C=20x10-6 farads, solve the equation for i given that when t=0, i=0 and  (5 marks

**QUESTION THREE (20 MARKS)**

1. solve the equation
2.  (5 marks)
3.  (5 marks)
4. (i) Using method of variation of parameters find the solution of the differential equation

  (5 marks)

(ii)Obtain the power series solution of the equation in ascending powers of x.

(5 marks)

**QUESTION FOUR (20 MARKS)**

1. Consider the differential equation
2. Show that it is not exact (2 marks)
3. Using an integrating factor of the form xn where n is a positive integer, solve the equation (5 marks)
4. Solve the initial value problem (8 marks)
5. Solve the equation  (5 marks)

**QUESTION FIVE (20 MARKS)**

1. Find the solution of the following linear system of differential equation (7 marks)





1. Find the power series solution for the equation 

(13 marks)