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**JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY**

**SCHOOL OF MATHEMATICS AND ACTUARIAL SCIENCE**

**UNIVERSITY EXAMINATION FOR DEGREE OF BACHELOR OF EDUCATION AND ACTUARIAL SCIENCE.**

**3rd YEAR 1st SEMESTER 2015/2016 ACADEMIC YEAR**

**REGULAR (MAIN)**

**COURSE CODE: SMA *301***

**COURSE TITLE: ORDINARY DIFFERENTIAL EQUATION I**

**EXAM: STREAM: (BEd., and Actuarial Sc.)**

**DATE: EXAM SESSION:**

**TIME: 2.00 HOURS**

**Instructions:**

1. **Answer question 1 (Compulsory) and ANY other 2 questions**
2. **Candidates are advised not to write on the question paper.**
3. **Candidates must hand in their answer booklets to the invigilator while in the examination room.**

**QUESTION ONE (COMPULSORY) (30 marks)**

1. Determine:
2. the order,
3. the unknown function, and
4. the independent variable

for

 (3 marks)

1. Find a solution to the boundary-value problem    If the general solution to the differential equation is  (6 marks)
2. Determine whether  is a solution of  (4 marks)
3. Show that  is a solution of  on  but is not a solution on  (5 marks)
4. Solve. (4 marks)
5. Determine the form of the trial solution for the differential equation (4 marks)
6. Assume  represents the mass of an element in. Suppose research has shown the instantaneous rate of decay of this element  is proportional to the amount present. Set up a model for this relationship. Hence obtain its general solution.(4 marks)

**QUESTION TWO (20 marks)**

1. Solve the following differential equation

 (6marks)

1. Solve the initial value problem:

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State the largest interval in which the solution is guaranteed to uniquely exist. (7marks)

1. Solve the initial value problem

  (7 marks)

**QUESTION THREE (20 marks)**

1. Determine whether or not  is exact. If exact, find the solution.(7marks)
2. Find the general solution of the given differential equation

 (6marks)

1. Show that



is homogeneous and find its solution. (7 marks)

**QUESTION FOUR (20 marks)**

1. Solve the initial-value problem using the method of undetermined coefficients

   (11 marks)

1. Solve the differential equation using the method of variation of parameters

 (9 marks)

**QUESTION FIVE (20 marks)**

1. A person places Kshs.  in a saving account which pays  percent interest per year, compounded continuously.

Find:

1. The amount in the account after  years. (3marks)
2. The time required for the account to double in value, presuming no withdrawals and no additions. (3marks)
3. A mass weighing  pounds stretches a spring  feet. Assuming that a damping force

numerically equal to  times the instantaneous velocity acts on the system, determine

the equation of motion if the mass is initially released from the equilibrium position

with an upward velocity of  ft/s. (6 marks)

1. A - kg mass is attached to a spring, stretching it from its natural length. The mass is started in motion from equilibrium position with an initial velocity of km/sec in the upward direction. Find the subsequent motion, if the force due to air resistance is N. (8 marks)