



(Knowledge for Development)

KIBABII UNIVERSITY
UNIVERSITY EXAMINATIONS
2016/2017 ACADEMIC YEAR
THIRD YEAR FIRST SEMESTER
SPECIAL/ SUPPLEMENTARY EXAMINATION
FOR THE DEGREE OF BACHELOR OF SCIENCE
MATHEMATICS

COURSE CODE: MAT 321

COURSE TITLE: ODE I

DATE: 15/09/17

TIME: 8 AM -10 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) Define the following terms as used in differential equations
- Order
 - Degree
 - Linearity (3 mks)
- b) Find the differential equation associated with the general solution $y = Ae^{3x} + Be^{2x}$ Where A and B are constants. (4 mks)
- c) Solve the following differential equation showing whether it is exact or not $(2x^3 - xy^2 - 2y + 3)dx - (x^2y + 2x)dy = 0$ (7 mks)
- d) Show that $\frac{dy}{dx} = \frac{4x-x^3}{4+y^3}$ is separable and hence find its particular solution under the condition $y(0) = 1$ (4 mks)
- e) By use of variation of parameters find the general solution of $y'' - 2y' + y = \frac{e^x}{1+x^2}$ (6mks)
- f) A mug of tea at 120°C is placed in an office with constant room temperature of 30°C . If from experience the mug of teadrops from 120°C to 80°C in 15 minutes, find the temperature of tea after 20 minutes, and the time it will take for the tea to cool to 50°C . (6mks)

QUESTION TWO (20 MARKS)

- a) Show that the function $y = e^{4x}$ is a solution of the differential equation $\frac{1}{2}y'' + y' - 12y = 0$ (3 mks)
- b) Solve $(x + 1)dy + ydx = 0$ (5 mks)
- c) Find the general solution of the differential equation $(D^3 + 2D^2 - 15D)y = 0$ (4 mks)
- d) Find the general solution of the differential equation $y'' - 3y' - 4y = 3xe^{3x}$ (8 mks)

QUESTION THREE (20 MARKS)

- a) Solve the differential equation $(x^2 + 1)dy + (y^2 + 1)dx = 0$ with initial Condition $y(0) = -1$ (5 mks)
- b) Test the differential equation $(x + 2y)dx + (2x + y)dy = 0$ for exactness and solve it if it is exact. (6 mks)
- c) Show that $\cos 3x$ and $\sin 3x$ form a linearly independent set of solutions for the differential equation $y'' + 9y = 0$. (4 mks)
- d) Find the general solution for $\frac{d^2y}{dx^2} - 4y = 4x^2 - x$ (5 mks)

QUESTION FOUR (20 MARKS)

- a) Verify whether the differential equation $(x^2 + y^2)dy + y^2dx = 0$ Is homogeneous and solve it (8mks)
- b) Solve the differential equation by first reducing it to homogeneous form $\frac{dy}{dx} = \frac{x+2y-4}{2x+y-5}$ (12mks)

QUESTION FIVE (20 MARKS)

- a) Solve the following equations using appropriate method
- i. $(x + 2y - 4)dx + (2x + y - 5)dy = 0$ (6 mks)
- ii. $(3x^2y^4 + 2xy)dx + (2x^3y^3 - x^2)dy = 0$ (8 mks)
- b) The sum of Kenya shillings 1000 is invested at the rate of 5% per annum compounded Continuously. What will be the amount be after 15 years (6 mks)