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(Knowledge for Development)

KIBABII UNIVERSITY
UNIVERSITY EXAMINATIONS
2017/2018 ACADEMIC YEAR
THIRD YEAR FIRST SEMESTER
SPECIAL/ SUPPLEMENTARY EXAMINATION
FOR THE DEGREE OF BACHELOR OF EDUCATION AND
BACHELOR OF SCIENCE

COURSE CODE: MAT 321

COURSE TITLE: ODE I

DATE: 04/10/2018

TIME: 11.30 AM- 1.30 PM

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

$$\frac{dy}{dx} = \frac{y^2}{x^2 + xy} \quad \text{at } x = \frac{1}{2}, y = 1 \quad [5 \text{ marks}]$$

- b) Solve the linear fractional equation

$$\frac{dy}{dx} = \frac{x + y - 2}{x - y + 4} \quad [5 \text{ marks}]$$

- c) List the types of 1st order differential equations

[2 marks]

- d) Solve the 2nd order differential equation

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

- c) Solve the non-homogeneous differential equation

$$y^{(3)} - y'' - 4y' + 4y = e^{3x} \quad [6 \text{ marks}]$$

- d) Solve the initial value problem

$$y'' - 3y' + 2y = \cos x \quad y(0) = 1, y'(0) = 2 \quad [8 \text{ marks}]$$

QUESTION TWO [20 MARKS]

- a) Solve the differential equation

$$(x^2 + y^2)dx + 2xydy = 0 \quad [5 \text{ marks}]$$

- b) Find the general solution of

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

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

[2 marks]

- d) A person deposits ksh 20 000 in a saving account which pays 5% interest per annum, compounded continuously. Find ,

(i) The amount in the account after 3 years [3marks]

(ii) The time required for the account to double assuming no withdrawals and no additional deposits [4 marks]

QUESTION THREE [20 MARKS]

- a) Using variation of parameter method solve [8marks]

$$\frac{d^2 y}{dx^2} - y = 4e^x$$

- b) Solve linear differential equation [6marks]

$$ydx - xdy + \log x dx = 0$$

- b) State the order and degree of the following differential equations

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

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

QUESTION FOUR [20 MARKS]

- a) Find the general solution to the initial value problem

$$u'' + 5u' + 6u = 0 \quad u(0) = 1, u'(0) = 0 \quad (10\text{mks})$$

- b) Solve $\frac{dy}{dx} + y \cot x = x$, given $y = 1$ when $x = \frac{\pi}{2}$ [10 marks]

QUESTION FIVE [20 MARKS]

- (a) solve $(x^2 + y^2)dx + 2xydy = 0$ [9Mks]

- (b) Find the general solution of $y'' - y' - 6y = x^2 + 2x$ [11 marks]