



KABARAK UNIVERSITY

UNIVERSITY EXAMINATIONS

MAIN CAMPUS

FIRST SEMESTER 2019/2020 ACADEMIC YEAR

EXAMINATION FOR THE DEGREE OF BACHELOR OF EM/CS/ACTS/EDUCATION

MATH 312: ORDINARY DIFFERENTIAL EQUATION I

STREAM: ...Y3S1...

TIME: 11:00-1:00PM

EXAMINATION SESSION: SEP-DEC

DATE : 18/12/2019

VENUE: AUDITORIUM

COPIES: 145

INSTRUCTIONS TO CANDIDATES

1. Answer Question 1 and any other two questions in the answer booklet provided.
2. Do not write on your question papers. All rough work should be done in your answer booklet.
3. Clearly indicate which question you are answering.
4. Write neatly and legibly.
5. Edit your work for language and grammar errors.
6. Follow all the instructions in the answer booklet

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Jesus as Lord. (1 Peter 3:15)*



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SECTION A: (Compulsory) TOTAL MARKS FOR THIS SECTION IS 30.

QUESTION ONE [30MARKS]

- a) Differentiate between the following terms

Partial differential equation and ordinary differential equation

[2mks]

Linear and nonlinear ordinary differential equation

[2mks]

- b) Give the order and degree of the following differential equation

[2mks]

$$\frac{d^2y}{dx^2} + 7\left(\frac{dy}{dx}\right)^3 + 8y^2 = \sin x$$

$$\left(\frac{dy}{dx}\right)^3 + 3\frac{d^2y}{dx^2} + 7y = e^{2x}$$

- c) Solve the equation $\frac{dy}{dx} = \frac{2x^2}{y^3}$

[3mks]

- d) Verify that the differential equation $(6xy + 2y^2 - 5)dx = (3x^2 + 4xy - 6)dy$ is exact and solve the equation

[5mks]

- e) Solve the Bernoulli's equation $\frac{dy}{dx} - y = 4y^5$

[4mks]

- f) Solve the second order homogeneous linear equation $\frac{d^2y}{dx^2} - 5\frac{dy}{dx} + 6y = 0$

[3mks]

- g) Consider the differential equation $4y'' + 4y' + y = 0$ passing through the point

$\left(1, e^{-\frac{1}{2}}\right)$ and $(2,0)$. Determine $y(0)$ and $y'(0)$

[4mks]

- h) Find the general solution of $y'' - y' - 2y = 2e^{-t}$, using the method of variation of parameters

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[5mks]

SECTION B. TOTAL MARKS FOR THIS SECTION IS 40.

ANSWER ANY TWO QUESTIONS FROM THIS SECTION. EACH QUESTION IN THIS SECTION CARRIES 20 MARKS.

QUESTION TWO [20MARKS]

Solve $(x^3 + y^3)dx - 3xy^2dy = 0$

[6mks]

Solve

$$\frac{dy}{dx} = \frac{2x + 3y + 4}{4x + 6y + 5}$$

[7mks]

Solve

$$y'' - 4y = 8x^2 - 2x$$

[7mks]

QUESTION THREE [20MARKS]

Solve the initial value problem $y'' - 10y' + 29y = 0$, $y(0) = 1, y'(0) = 3$

[6mks]

Solve $\frac{dy}{dx} = \frac{xy^2+x}{yx^2+y}$

[7mks]

Use the method of undetermined coefficient to solve $y'' + 3y' + 2y = e^x - 3$

[7mks]

QUESTION FOUR [20MARKS]

Solve the following equation $\sin^2 y dx + \cos^2 x dy = 0$ where $y\left(\frac{\pi}{4}\right) = \frac{\pi}{4}$

[7mks]

Find the general solution to the Cauchy- Euler equation $x^2y'' + 5xy' + 4y = 0$

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[6mks]

Solve $\frac{dy}{dx} = -\frac{2}{y} - \frac{3y}{2x}$

[7mks]

QUESTION FIVE [20MARKS]

Solve the linear equation $(1 - x^2) \frac{dy}{dx} - xy = 1$

[7mks]

Solve the given ODE using the method of variation of parameters

$$y'' + y = \sec x$$

[8mks]

Find the differential equation whose solution is $y = A \cos 8x + B \sin 8x$

[5mks]

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