



MACHAKOS UNIVERSITY

University Examinations 2020/2021 Academic Year

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS AND STATISTICS

SECOND YEAR SECOND TERM EXAMINATION FOR

DIPLOMA IN BUILDING AND CIVIL ENGINEERING

MATHEMATICS II

DATE: 4/6/2021

TIME: 8.30-11.30 AM

INSTRUCTIONS:

Answer **ALL** the questions.

ALL questions carry equal marks

1. a) i) Simplify $(3i+2j) - (i-9j)$
ii) Express $\frac{2+3i}{1-i}$ in the form $p+iq$ ($p, q \in R$) (6 marks)
- b) Differentiate the following with respect to x . i) $y = x^2 \cos 3x$ (7 marks)
- c) Find the value of $\frac{dy}{dx}$ at the point where $x = 2$ on the curve with the equation
 $y = x^2(5x-1)$ (7 marks)
2. a) Determine i) $\int x \cos(x^2 + 5) dx$
ii) $\int_0^1 \frac{x dx}{\sqrt{1+4x^2}}$ (10 marks)
- b) Determine $\int \frac{6x^2+7x-25}{(x-1)(x+2)(x-3)} dx$ (10 marks)
3. Solve the following differential equations;
a) $(x+2)\frac{dy}{dx} = (1-y)$ (8 marks)
b) $9\frac{d^2y}{dx^2} - 12\frac{dy}{dx} + 4y = 0$, given that $y = 3$ when $x = 0$
 $\frac{dy}{dx} = 4$ when $x = 0$ (12 marks)

4. a) show that the general solution of the differential equation

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

may be expressed in the form $x(x+y) = cy$, where c is an arbitrary constant. (9 marks)

- b) Using the method of undetermined coefficient, solve the differential equation

$$\frac{d^2y}{dt^2} + 4\frac{dy}{dt} + 3y = t^3 + t^2 + 2 \quad (11 \text{ marks})$$