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(University of Choice)

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

MAIN CAMPUS

UNIVERSITY EXAMINATIONS
2022/2023 ACADEMIC YEAR

THIRD YEAR SECOND SEMESTER EXAMINATIONS

FOR THE DIPLOMA
IN
ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE CODE: **DEE 092**

COURSE TITLE: **ENGINEERING MATHEMATICS VI**

DATE: Thursday 13th April, 2023 **TIME:** 9.00 a.m – 11.00 a.m

INSTRUCTIONS TO CANDIDATES

ANSWER QUESTION ONE AND ANY OTHER TWO QUESTIONS.
QUESTION ONE CARRIES 30 MARKS AND ALL OTHERS 20 MARKS EACH.

TIME: 2 Hours

MMUST observes ZERO tolerance to examination cheating

DEE 092: ENGINEERING MATHEMATICS

SECTION A (Answer all Questions in this section)

Question ONE

a) Show $\lim_{z\to\infty} z^n = \infty$ (for n a positive integer).

(3 Marks)

b) Use the Cauchy-Riemann equations to show that $f(z) = \bar{z}$ is not differentiable.

(5 Marks)

c) Use the Cauchy-Riemann equations to show that e^z is differentiable and its derivative is e^z

(5 Marks)

d) The Newton Raphson method formula for finding the square root of real number R from the equation x^2-R=0 is?

(3 Marks)

(4 Find the volume of the space region bounded by the planes z=3x+y-4 and z=8-3x-2y where x,y>0

(4 Marks)

(5 Evaluate $\iint (y^2 zi + y^3 j + xzk) . dA$ where S is the boundary of the cube defined by -1≤x≤1, -1≤y≤1, and 0≤z≤2

(4Marks)

(6 f(z) = $|z|^2=x^2+y^2$, confirm that the Cauchy Riemann conditions are satisfied

(6 Marks)

SECTION B (Answer any TWO questions)

Question TWO

Evaluate the line integral $I = \int a. dr$, where $a = (x + y)i + (y - x)j$, along each of the paths

a) the parabola $y^2 = x$ $from$ $(1,1)$ to $(4,2)$

(6 Marks)

b) The curve $x = 2u^2 + u + 1$, $y = 1 + u^2$ $from$ $(1,1)$ to $(4,2)$

(7 Marks)

c) The line y=1 from (1,1) to (4,1) followed by the line y=x from (4,1) to (4,2)

(7 Marks)

Question THREE

a) Show that the area of a region R enclosed by a simple closed curve C is given by $A = \frac{1}{2}\oint(xdy - ydx) = \oint xdy = -\oint ydx$. hence calculate the area of the ellipse $x = acos\emptyset\ ,\ y = bsin\emptyset$

(10 Marks)

b) Evaluate the surface integral $I = \int_S a.dr$, where a=xi and S is the surface of hemisphere $x^2+y^2+z^2=a^2$ with $z \geq 0$

(10 Marks)

Question FOUR

Assume as given the non-linear equations

$f_1(x_1,x_2) = x_1^2+3x_1x_2- 4=0$

$f_2(x_1,x_2) = x_1x_2 - 2x_2^2+5 =0$

Determine the values of x_1 and x_2 by using the Newton Raphson method (perform 4 iterations)

(20 Marks)

Question FIVE

Use Gauss – Seidel iterative technique to solve the system below starting at a flat start $x^0 = 0$, $y^0 = 0,\ z^0 = 0$ (Perform 6 iterations) (20 Marks)

$$\begin{bmatrix} 1 & 1 & 1 \\ 1 & 2 & 3 \\ 2 & 3 & 4 \end{bmatrix} = \begin{bmatrix} 9 \\ 20 \\ 29 \end{bmatrix}$$