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UNIVERSITY OF NAMIBIA

FACULTY	AGRICULTURE, ENGINEERING AND NATURAL SCIENCES
SCHOOL	AGRICULTURE AND FISHERIES SCIENCES
DEPARTMENT	FISHERIES AND OCEAN SCIENCES
SUBJECT	MATHEMATICS FOR AGRICULTURE
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MARKS	100

SECOND OPPORTUNITY EXAMINATION QUESTION PAPER

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Internal Moderator: Ms. H N Nafuka

This question paper consists of **FIVE** printed pages including this cover page.

Instructions to Candidates
1. Attempt **ALL** questions in Section A and **ANY THREE** questions in Section B   2. Non-programmable calculators may be used

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EXAMINATIONS

SECTION A (40 marks)

ANSWER **ALL** QUESTIONS IN THIS SECTION

Question A1. [7 marks]

(a) Find the simple interest payable on a loan of N$120 000 at 10% p.a. at the end of 5 years. [2]

(b) Find the balance if N$500 is invested at an annual interest interest rate of 12% for 2 years, compounded annually. [3]

(c) The students in Ellie's class walk, cycle, or drive to school in the ratio of 2:1:4. If 8 students walk, how many students are there in Ellie's class altogether? [2]

Question A2. [7 marks]

Let A and B be sets such that $A, B \subseteq U$. U is a universal set containing all alphabets.

(a) Suppose that $A = \{a, c, d, e, g, n, m\}$, $B = \{a, d, g, n, k, h\}$. Determine the following: $|A \triangle B|$ [3]

(b) Let D and E be sets. Use the Venn Diagram to show the following sets,
  (i) $D \cap E^c$ [2]
  (ii) $D \triangle E$ [2]

Question A3. [10 marks]

Given the matrices

$$\mathbf{A} = \begin{pmatrix} -1 & 4 \\ 2 & -5 \end{pmatrix}, \mathbf{B} = \begin{pmatrix} 4 & 0 & 4 \\ -2 & 1 & -3 \\ 1 & 2 & 1 \end{pmatrix}, \mathbf{C} = \begin{pmatrix} 3 & 6 & -3 \\ 0 & 5 & 2 \\ 1 & -3 & -4 \end{pmatrix}$$

Find

(i) $5\mathbf{B} - 3\mathbf{C}^T$, (ii) $det\mathbf{B}$, (iii) $\mathbf{A}^{-1}$ [4, 3, 3]

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Question A4. [**9 marks**]

(a) Determine the nth term for the given sequence:

$1, \frac{3}{4}, \frac{5}{9}, \frac{7}{16}, \frac{9}{25}$ [2]

(b) The $8th$ term of the geometric sequence is 32, and the $5th$ term is 18. Find the first term and the nth term. [3,4]

Question A5. [**8 marks**]

(a) Find the derivative of the following functions;

(i) $f(x) = 5x^2 - \frac{2}{x^3}$ [3]

(ii) $g(x) = 4x^4 - 2x^3 - 3x^2 + 7$ [3]

(b) Write the following equation in exponential form [2]

$$t - 1 = \log_{10}(x + 2)$$

SECTION B (60 marks)

ANSWER ANY **THREE (3)** QUESTIONS FROM THIS SECTION

Question B6. [20 marks]

(a) In the universal set $U = \{-8, -4, 0, 1, 2, 4, 7, 8, 9\}$ let $A = \{x \in U | x^3 \in U\}$ and $B = \{x \in U | x \text{ is prime}\}$
List the elements of A, $A \setminus B$, and of $(A \cup B)^c$ [2,3,3]

(b) Let A and B be sets. Using mathematical reasoning, prove that $(A \cup B)^c = A^c \cap B^c$ [6]

(c) Make use of the Venn diagram to solve this problem. There are 57 first-year fishery students. Of them, 13 do not like any of the modules. For the rest, it is known that 25 like Diversity, 19 Mathematics, and 20 like Chemistry. Furthermore, 6 of them like all the three mentioned modules, 8 like both Diversity and Mathematics, and 7 like both Mathematics and Chemistry. Find how many students like:

   (i) both Diversity and Chemistry

   (ii) Only one module [6]

Question B7. [20 marks]

(a) In an arithmetic sequence, $a_3 = 10$ and $a_{10} = 31$. Find

   (i) the common difference d and the first term a_1 [4]

   (ii) the sum of 21st terms [3]

   (iii) k such that $a_k = 52$ [3]

(b) Solve the system below by any method.

$$2x - y - 3z = -7$$

$$-x + 2y - 3z = 11$$

$$x + y + 4z = 4$$

[10]

Question B8. [20 marks]

(a) Maria started a weight loss dieting exercise with a weight of 150 lbs. Her weight reduced to 145 lbs after 5 weeks of dieting. Express the weight loss as a percentage of her body weight. [3]

(b) In an anti-malaria campaign, it is claimed that regular spraying with a new insecticide will reduce the mosquito population by 25% each year.

    (i) If the initial population is P_0, find the formula for the population P after t years. [4]

    (ii) How long will it take to halve the initial population? [3]

(c) Fit an exponential model to the following data: [10]

t	0.4	0.8	1.2	1.6	2	2.3
w	800	975	1500	1950	2900	3600

Question B9. [20 marks]

(a) An open rectangular tank oh height h metres with a square base x metres is to be constructed so that it has the capacity of $300m^3$. Prove that the surface area of the four walls and the base will be $(\frac{1200}{x} + x^2)$ square metres. Find the value of x for this expression to be minimum. [5,5]

(b) Find the critical values of the function $f(x) = x^3 - 2x^2 - 4x$ and determine whether they are maximum or minimum values [5]

(c) Find the following definite integral;

$$\int_1^0 (x^3 - 3x^2 + 3\sqrt{x})dx$$

[3]

(d) Find the area under the curve.
$f(x) = x + 2$, on $[-1, 4]$

[2]

END OF EXAMINATION

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