Faculty of Health, Natural Resources and Applied Sciences

School of Natural and Applied Sciences

Department of Mathematics, Statistics and Actuarial Science

QUALIFICATION: **Bachelor of Agriculture, Bachelor of Business Management, Bachelor of Horticulture, Bachelor of Marketing, Bachelor of Natural Resources Management, Bachelor of Entrepreneurship, Bachelor Regional and Rural Development, Bachelor of Public Management, Bachelor of Procurement and Supply Chain Management, Bachelor of Transport Management, Bachelor of Human Resources Management**	
QUALIFICATION CODE: **07BAGA, 07BBMN, 07BHOR,07BMAK, 07BNRS,07BOEN, 07BORR, O7BPMA, 07BPSM, 07BRAR, 07BTRA, 07HRM**	LEVEL: **5**
COURSE: **INTRODUCTION TO MATHEMATICS (BUSINESS AND MANAGEMENT)**	COURSE CODE: **ITM111S**
DATE: **NOVEMBER 2024**	SESSION: **1**
DURATION: **3 HOURS**	MARKS: **100**

1ST OPPORTUNITY EXAMINATION: QUESTION PAPER

EXAMINER: Ms K. DAVID, Ms Y. NKALLE, Ms H. WILHELM, Ms P. NGHISHIDIVALI

MODERATOR: Ms A. SAKARIA

INSTRUCTIONS:

1. Answer **ALL** questions on the separate answer sheet.
2. Please write neatly and legibly.
3. Do not use the left side margin of the exam paper. This must be allowed for the examiner.
4. No books, notes and other additional aids are allowed.
5. Mark all answers clearly with their respective question numbers.

PERMISSIBLE MATERIALS:

1. Non-Programmable Calculator

This paper consists of 5 pages including this front page.

QUESTION 1: MULTIPLE CHOICE   **[20 MARKS]**

Write down the letter corresponding to the best option for each question in the answer booklet/sheet provided.

1.1.   Prime numbers are defined as: [2]
   A. Numbers divisible by 1, 2, and themselves
   B. Numbers divisible only by 1 and themselves
   C. Numbers divisible by any number
   D. Numbers divisible by 2 and themselves

1.2.   Which of the following is an example of an irrational number?   [2]

   A. $\dfrac{1}{2}$ B. 3.14 C. $\sqrt{2}$ D. -5

1.3.   A mixed number consists of: [2]
   A. Only a whole number
   B. A whole number and a proper fraction
   C. A whole number and an improper fraction
   D. Only an improper fraction

1.4.   Find the HCF of the numbers 24, 36, and 60.   [2]

   A. 6   B. 8   C. 12   D. 18

1.5.   Simplify the expression $\dfrac{5x^2}{x} + \dfrac{3x}{x}$ [2]

   A. $5x^2 + 3$ B. $5x + 1$ C. $5x + 3$ D. $5x + x$

1.6.   Which of the following is a polynomial of degree one   [2]

   A. $3x^2 + 4 = 5x$ B. $2x - \dfrac{5}{2} = 3$ C. $\dfrac{1}{x} + 7 = 4x$ D. $x(x + 2) = 3$

1.7.   Which of the following is a surd?   [2]
   A. $\sqrt{26}$ B. $\sqrt{4}$ C. $\sqrt{64}$ D. $\sqrt[3]{27}$

1.8. A group of workers is digging a trench. When there are 6 workers, the length of the trench they can dig is 18 meters in 1 day. All the workers dig at the same rate. Work out the length of the trench 1 worker could dig in 1 day. [2]

A. 4m B. 3m C. 0.33m D. 6m

1.9. Determine the value of n that makes the ratio n: 15 the same as the ratio 36: 90. [2]

A. $n = 5$ B. $n = 1350$ C. $n = 10$ D. $n = 6$

1.10. The shaded region on the venn diagram below represents: [2]
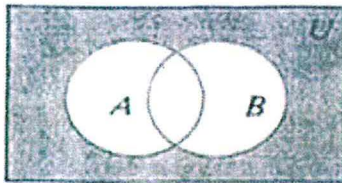
A. $A \cup B$ B. $A \cap B$ C. $(A \cup B)^c$ D. $A^c - B^c$

QUESTION 2: TRUE/FALSE [10 MARKS]

Evaluate the statements and select whether the statement is **True (T)** or **False (F).** Write the correct answer next to the corresponding number on your ANSWER SHEET.

2.1.1. When solving inequalities, dividing or multiplying by a negative value reverses the direction of the inequality sign. [2]

2.2. $(log_2 x)^3 = 3 log_2 x$ [2]

2.3. The discriminant of the quadratic equation $3x^2 - 4x + 1 = 0$ is 2. [2]

2.4. Given two sets A and B, $A \oplus B = (A - B) \cup (B - A)$. [2]

2.5. If A and B are matrices whose determinants are not equal to zero, then $(AB)^{-1} = A^{-1}B^{-1}$ [2]

SECTION B: STRUCTURED QUESTIONS

QUESTION 3: [70 MARKS]

3.1. Evaluate the following expressions without using a calculator:

3.1.1. $\frac{1}{3} \ of \ \frac{3}{4} \div \frac{7}{8} \times 1\frac{1}{2}$ [5]

3.1.2. $2\sqrt{3} + 3\sqrt{27} + 6\sqrt{12}$ [5]

3.1.3. $log_5 25 - log_{125} 5 + log_1 1$ [5]

3.2.   Round the following numbers to the nearest value indicated in brackets:

3.2.1. 2.2731   (to 3 decimal places)   [1]

3.2.2. 4090.0124   (to 2 significant figures)   [1]

3.3.   Solve the following simultaneous equations using the **substitution method**.   [4]

$$y = 3x - 1$$

$$2x + 4y = 10$$

3.4.   Factorize the following expressions:

3.4.1. $6mx - 3nx + 2my - ny$ [4]

3.4.2. $9x^2 - 25y^2$ [3]

3.5.   Three companies A, B, and C, produce smartphones in a city. A survey of 200 people was conducted to find out their preferences. The results showed the following: 70 people own a smartphone from Company A. 80 people own a smartphone from Company B. 90 people own a smartphone from Company C. 30 people own smartphones from both Company A and Company B. 40 people own smartphones from both Company B and Company C. 20 people own smartphones from both Company A and Company C. 10 people own smartphones from all three companies, A, B, and C.

3.5.1. Draw a Venn diagram to represent the information given above.   [6]

3.5.2. Calculate the number of people who own smartphones only from: Company A, Company B, Company C.   [3]

3.5.3. Find the number of people who do not own smartphones from the three companies.

[2]

3.6.   Use Cramer's rule to find the values of x and y in the following system of linear equations: [5]

$$3x + 4y = 7 \text{ and } 5x - 2y = 3$$

3.7.   Determine the value of $x, y,$ and z in the following matrix equation: [5]

$$\begin{bmatrix} x & 2 \\ y & 3 \end{bmatrix} + \begin{bmatrix} 4 & z \\ x & y+z \end{bmatrix} = \begin{bmatrix} 5 & 5 \\ 3 & 8 \end{bmatrix}$$

3.8.   Let $A = \begin{bmatrix} 0 & -1 \\ -4 & 3 \end{bmatrix}$, and $B = \begin{bmatrix} -1 & -2 \\ -3 & -4 \end{bmatrix}$,

3.8.1. A^{-1} [4]

3.8.2. B^2 [4]

3.9.   A progression is given by $3m, (3m + 5), (3m + 10)$ … If the 15th term is 98, find the value of m. [5]

3.10.   FNB is offering 10% interest on an account. Ribelius makes an initial deposit of $N\$20\ 000$ in the account. Calculate the interest and the total amount in the account after 5 years if the bank uses compound interest compounded quarterly. [4]

3.11.   Determine the sum of the following series:

3.11.1. $\sum_{S=1}^{3} 5S$ [2]

3.11.2. $\sum_{n=1}^{3} \frac{(-1)^{n+1}}{n}$ [2]

END OF QUESTION PAPER