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OF SCIEᑎCE ᗩᑎᗪ TECᕼᑎOᒪOGY

FACULTY OF HEALTH, NATURAL RESOURCES AND APPLIED SCIENCES
SCHOOL OF NATURAL AND APPLIED SCIENCES
DEPARTMENT OF MATHEMATICS, STATISTICS AND ACTUARIAL SCIENCE

QUALIFICATION: Bachelor of Technology: Geo-Information Technology, Bachelor of Human Resources Management, Bachelor of Marketing, Bachelor of Transport Management, Bachelor of Business Administration, Bachelor of Agricultural Management, Bachelor of Horticulture	
QUALIFICATION CODE: 07BGIT,07BHRM,07BMAR, 07BBMN, 27BAGA,07BTRM,07BHOR,07BPSM,04CIPM,07BRAR,07BENT	**LEVEL: 5**
COURSE NAME: INTRODUCTION TO MATHEMATICS (BUSINESS AND MANAGEMENT)	**COURSE CODE:** ITM111S
SESSION: JULY 2023	**PAPER:** THEORY
DURATION: 3 HOURS	**MARKS:** 100

SUPPLEMENTARY / SECOND OPPORTUNITY EXAMINATION QUESTION PAPER	
EXAMINER(S)	**Ms A. SAKARIA,** Ms K. DAVID, Ms P. NGHISHIDIVALI, Ms R. KATALE, Mr A. MPUGULU, Mr F. NDINODIVA, Mr B. OBABUEKI
MODERATOR:	Mr T. KAENANDUNGE

INSTRUCTIONS	
	1. Answer ALL the questions in the answer sheet.
	2. **QUESTION 1** of this question paper entail multiple choice questions with options A to D. Write down the letter corresponding to the best option for each question.
	3. For **QUESTION 2** indicate whether the given mathematical statements are true (**T**) or false (**F**).
	4. **QUESTION 3** show clearly all the steps used in the calculations.

PERMISSIBLE MATERIALS
1. Non-programmable calculator without a cover.
THIS QUESTION PAPER CONSISTS OF 4 PAGES (Including this front page)

QUESTION 1 [30 MARKS]
Write down the letter corresponding to the best option for each question in the answer booklet/sheet provided.

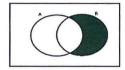1.1 Evaluate: $\log_2 16 + \log_3 27 + \log 1$. [3]

    A. 3   B. 3   C. 7   D. 8

1.2 What statement does the shaded region represent? [3]

    A. $A^c \cap B$ B. $A \cap B^c$ C. $A \cup B^c$ D. $A^c \cup B$

1.3 Find the Lowest Common Multiple (LCM) of the numbers $255, 105$ and 90. [3]

    A. 5355   B. 255   C. 1025   D. 10710

1.4 Simplify $\left(\dfrac{1}{4}\right)^{-\frac{1}{2}}$. [3]

    A. $\dfrac{1}{2}$ B. 2 C. $\sqrt{2}$ D. $\dfrac{1}{16}$

1.5 Given vector $A = (-2 \quad 9)$, find $2A$. [3]

    A. $(-4 \quad -9)$ B. $(4 \quad 18)$ C. $(-4 \quad 18)$ D. $(-18 \quad -4)$

1.6 If $\left(3 + 2\sqrt{5}\right)^2 = 29 + k\sqrt{5}$ then, what is the value of k? [3]

    A. 12   B. 29   C. 6   D. 39

1.7 Express the statement "5 more than the product of 3 and a number" in terms if x. [3]

    A. $5x - 3$ B. $3x + 5$ C. $3 - 5x$ D. $3x(5)$

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? [3]

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

1.9 Let sets $A = \{1, 2, 3\}$ and $B = \{3, 4, 5\}$. Find the symmetric difference $A \oplus B$. [3]

A. $\{1, 2\}$ B. $\{1, 2, 4, 5\}$ C. $\{4, 3\}$ D. $\{2, 5, 1, 4, 3\}$

1.10 Determine the sum of the series $\sum_{n=1}^{5}(1+n)$. [3]

A. 6 B. 17 C. 20 D. 25

QUESTION 2 [10 MARKS]

Indicate whether the given mathematical statements are true (T) or false (F)

2.1   The number 0.51×10^{-3} is in standard form. [2]

2.2   The expression $\ln e \sqrt{x^3}$ simplifies to $x^{\frac{3}{2}}$. [2]

2.3   The expression $16p^4 - 81q^8$ can be factorised fully as $4p^2 - 9q^4$ [2]

2.4 $\sqrt[x]{a} + \sqrt[x]{b} = \sqrt[x]{a+b}$ [2]

2.5 $\log(x^2) = (\log x)^2$ [2]

QUESTION 3 [60 MARKS] (Clearly show all your work)

3.1   Use Cramer's Rule to solve the following linear equations: [5]
       $x + 2y = -11$ and $-2x + y = -13$

3.2   If matrices $M = \begin{bmatrix} 4 & 1 \\ -4 & 0 \end{bmatrix}$, $N = \begin{bmatrix} -1 \\ 5 \end{bmatrix}$ and $P = \begin{bmatrix} 2 & 1 \\ -4 & -1 \end{bmatrix}$, find.

       3.2.1 MN [4]

       3.2.2 P^{-1} (The inverse of P) [6]

       3.2.3 $M - 7P$ [4]

3.3 Among the 133 students (S) at a school, 44 take Geography (G), 48 take Biology (B), 32 take Mathematics (M), 8 take Geography and Biology , 9 take Geography and Mathematics,7 take Biology and Mathematics. 30 students take none of the three subjects while 3 take all three subjects.

3.3.1 Use a Venn diagram to present the information given above. (5)

3.3.2 Find the number of students who take geography or biology. (2)

3.3.3 Find the number of students who take only Mathematics. (2)

3.3.4 Find the number of students who take mathematics but not geography. (2)

3.4 Given that the first term of the geometric progression is 5 and the sixth term is 1215:
3.4.1 What is the common ratio? (4)

3.4.2 Find the 10th term. (5)

3.5 How many terms are there in the progression, $42; 35; 28; 21...; -336$? (6)

3.6 Timo wishes to take a loan at an annual simple interest rate of 14.5% for 7 months. He is told that he will have to pay back the sum of N\$5422.92 at the end of the 7th month. Calculate the loan Timo wishes to take? (5)

3.7 Evaluate the following without using a calculator, $\dfrac{\sqrt{243} + \sqrt{27} - \sqrt{48}}{2\sqrt{3}}$. (6)

3.8 Simplify the algebraic fraction completely $\dfrac{2x^2 - 2x}{2x + 2} \div \dfrac{x^2 - x}{x + 1}$. (4)

END OF EXAMINATION QUESTION PAPER