NESA NATIONAL EXAMINATION AND SCHOOL INSPECTION AUTHORITY

Mathematics II

T210

Tuesday, 01/08/2023
08:30 – 11:30 AM

Names:.....

Index number:.....

TVET NATIONAL EXAMINATIONS, LEVEL 5, 2022-2023

QUESTIONS and ANSWERS BOOKLET

OPTIONS/ TRADES : OFM; TAL; ART; SCE; MUS; LTW; ACC; BUS; FBS; TRS; CUA; IND

SUBJECT/EXAM: MATHEMATICS II

DURATION: 3 Hours

Read carefully the instructions on page 1 & 2.

FOR EXAMINER'S USE ONLY

QUESTIONS	1	2	3	4	5	6	7	8	9	10	Total
Marks											
QUESTIONS	11	12	13	14	15	16	17	18	19	20	Total
Marks											
QUESTIONS	21	22	23	24	25	26	27	28	29	30	Total
Marks											

TVET NATIONAL EXAMINATIONS, LEVEL 5, 2022-2023

INSTRUCTIONS TO CANDIDATES: PART I (ANSWER BOOKLET)

1. A candidate should fill in the actual names and the Index number on the cover of this questions and answer booklet on the provided place.

2. It is illegal for a candidate to write any of names, Index number or school name inside the answer booklet.

3. No candidate should remove or tear any pages or part of it in the answer booklet.

4. A candidate should answer in the language in which the examination is set.

5. A candidate should sign on the sitting plan when submitting the answer booklet. He/she has also to check if the answer booklet is well sealed.

6. No extra paper is allowed in the examinations room. If a candidate is caught with it his/her results will be nullified.

7. No candidate is allowed to write answers not related to the subject being sat for, otherwise it will be considered as a cheating case.

8. Write your answers on the 16 lined pages (From page 7 to page 22).

9. Use the last non-lined pages as draft.

10. Results for any candidate who is caught in examination malpractices are nullified. The cheating can be recognized during examinations administration, marking exercise or even thereafter.

N.B: 1) After results publication, there is no remarking and no candidate is given his/her answer booklet for review. This answer booklet is a property of NESA.
2) Claims are only received online within 30 days after results publication. A link will be provided after results publication.

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INSTRUCTIONS TO CANDIDATES (QUESTION PAPER)

This Exam paper is composed of Two Sections (A, B). Follow the instructions given below, and answer the indicated questions for a total of 100 marks

Section **A**: Fifteen (**15**) questions, all **Compulsory** **55 marks**

Section **B**: Among the six (**6**) questions, attempt any three (**3**) **45 marks**

Allowed materials:

- **Blue** or Black **pen**
- Mathematical set
- Non-programmable calculator

Note:

Every candidate is required to carefully comply with the provided assessment instructions.

SECTION A: Attempt all questions **(55 marks)**

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01. Set $A = \{1,2,3,4,5,6,7,8,9,10\}$. Write down the subsets of set A which are: **(2marks)**

a) Even numbers

b) Odd numbers

c) Prime numbers

d) Intersection between even and prime numbers subsets.

02. From the following mathematical expression: **(2marks)**
$x + 1 = 0$, $5 < x$, $1 = x^2$ and $x^3 - 1 = 0$.

Which one of these expressions is of the form of:
a) Linear inequality,
b) Quadratic equation.

03. Solve in the set of real numbers:

a) $3x - 4 = 2x + 1$ **(2marks)**

b) Solve the following inequality: $x - 3 < 7$ **(2marks)**

04. Use clear sketches to differentiate a horizontal bar chart with a vertical bar chart. (Hint: use only 2 bars). **(4marks)**

05. Evaluate the following limit: **(4marks)**

$$\lim_{x \to 2} \frac{2x^2 - 3x - 2}{x - 2}$$

06. Solve for x: **(4marks)**
a) $10^x = 1$
b) $\log 10{,}000{,}000 = x$

07. You are given the following set: **(3marks)**

$\mu = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$

and set $A = \{1, 2, 4, 5, 7\}$. Find A'

08. Solve in the set of real numbers

a) $\frac{3}{x-6} = \frac{4}{2x-5}$ **(2marks)**

b) $\frac{-x+5}{x-3} = \frac{4}{7}$ **(2marks)**

09. Given the following function:

$f(x) = \frac{x^3+x}{5}$

a) Find $f(-x)$ and $-f(x)$ **(2marks)**

b) Comment on the result found in a) about the parity of the function f. **(2marks)**

10. Solve in set of real numbers: $\log_3(x-2)+1 = \log_3(2x-1)$ **(4marks)**

11. Solve algebraically the following quadratic equation $2x^2 + x - 6 = 0$. **(4marks)**

12. Copy and complete table below: **(5marks)**

Height(cm)	f	C.F	Middle point (c_i)	$c_i \times f_i$
150-154	4			
155-159	1			
160-164	5			
165-169	3			
170-174	2			
175-179	7			

13. Find the domain of definition of the following function: **(4marks)**

$f(x) = \frac{\sqrt{x^2-4}}{x^2-8x+15}$.

14. Find the derivative of the following function: **(4marks)**

$f(x) = (x^2+6)(x-2)$

15. When a die is tossed, what are the likelihoods of getting the following events? **(3marks)**

a) 1 or 2 b) 2 or 4 or 6 c) 3 or 5

SECTION B: Attempt any Three (3) questions **(45 marks)**

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16. The lengths of sides of a triangle are $7\ cm, 10\ cm$ *and* $16\ cm$.

a) Identify the size of each of angle of the triangle by giving the answer correct to the nearest degree (approximate without decimal). **(12marks)**

b) Prove that the angles found above in (a) are the interior triangle angles. **(1mark)**

c) Sketch the triangle and put on it the sizes of its sides and its angles. **(2marks)**

17. Given the following quadratic equation:

$$z^2 - 6z + 18 = 0.$$

a) Show that it has no real solutions. **(4marks)**

b) Consider $\sqrt{-1} = i$ and find the roots of the equation above. **(5marks)**

c) Let z_1 and z_2 be the roots of the given equation. Evaluate: **(6marks)**

i) $z_1 + z_2$

ii) $z_1 - z_2$

iii) $z_2 - z_1$

iv) $z_1 \times z_2$

v) $\frac{z_1}{z_2}$

18. **a)** A coin is weighted so that heads are three times as likely to appear as tails. Find P(H) and P(T). **(2marks)**

b) A letter is chosen from the letters of the word ≪ *MATHEMATICS* ≫.

What is the probability that the letter chosen is an ≪ *a* ≫? **(3marks)**

c) A group consists of 4boys and 7girls. In how many ways can a team of three be selected if it is to contain: **(10marks)**

i) 1boy and 2girls

ii) Girls only

iii) Boys only.

19. Solve Using the Cramer's Rule: **(15marks)**

$$\begin{cases} x + y + z = 3 \\ 2x - y = 1 \\ 4x + y - z = 4 \end{cases}$$

20. According to United Nation data, the world population at the beginning of 1975 was approximately 4billions and growing at rate of about 2% per year. Assuming an exponential growth model, estimate the world population at the beginning of the year 2020. **(15marks)**

21. Given the function f(x) = $\frac{x^3}{3} + \frac{x^2}{2}$

a) State the value of x for which f(x) is increasing. **(5marks)**

b) Find the x-coordinate of each extreme point of f(x). **(4marks)**

c) State the values of x for which the curve of function is concave upwards. **(4marks)**

d) Find the x-coordinate of each point of inflection. **(2marks)**

END OF ASSESSMENT

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