1920/104
MATHEMATICS
November 2021
Time: 3 hours

THE KENYA NATIONAL EXAMINATIONS COUNCIL

CRAFT CERTIFICATE IN INFORMATION TECHNOLOGY

MODULE I

MATHEMATICS

3 hours

INSTRUCTIONS TO THE CANDIDATE

You should the following for this examination:

- *Scientific calculator.*
- *Statistical tables.*
- *Geometrical set.*
- *Graph paper.*

*This paper consists of **TWO** sections: Section **A** and **B**.*
*Answer **ALL** the questions in section **A** and any **FOUR** questions from section **B** in the answer booklet provided.*
Candidate should answer the questions in English.

This paper consists of 4 printed pages.

Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

Turn over

SECTION A (40 marks)

*Answer **ALL** the questions from this section.*

1. Convert the decimal number 7423_{10} to its equivalent for each of the following number systems:

   (a) Octal;

   (b) BCD. (4 marks)

2. Convert the octal number 325_8 to its equivalent for each of the following of number systems:

   (a) excess-3;

   (b) Hexadecimal. (4 marks)

3. Use the graphical method to solve the following set of equations:

$$4y + 3x = 100$$
$$4y - 19x = 12$$

(4 marks)

4. Given that set U = {a, b, c, d, b, e, f, g, h}, B = {a, c, d, e} and A= {a, b, c}; Determine each of the following operations:

   (a) $A \cap B$;

   (b) $A^c \cap B$. (4 marks)

5. Use the binomial theorem to expand the following expression $(4x + 3)^4$. (4 marks)

6. Describe each of the following matrices:

   (a) diagonal matrix;

   (b) triangular matrix. (4 marks)

7. Given matrices $\boldsymbol{X} = \begin{bmatrix} 1 & 5 & -1 \\ -1 & 2 & 2 \\ 0 & -3 & 3 \end{bmatrix}$ and $\boldsymbol{Y} = \begin{bmatrix} -1 & -4 & 3 \\ 1 & -2 & -2 \\ -3 & 3 & -5 \end{bmatrix}$, determine $\boldsymbol{X} + 3\boldsymbol{Y}$.

(4 marks)

8. Solve $5x \leq -4y - 12$ and represent the solution on a graph. (5 marks)

9. Determine the 4^{th} term of the expression $(3x+y)^7$. (3 marks)

10. Explain each of the following terms as used in statistics:

    (a) discrete variable;

    (b) continuous variable. (4 marks)

SECTION B (60 marks)

*Answer any **FOUR** questions from this section.*

11. (a) Given matrix $S = \begin{bmatrix} 1 & 7 \\ 9 & 2 \end{bmatrix}$ and $R = \begin{bmatrix} 2 & 4 \\ 2 & 3 \end{bmatrix}$, show that:

(i) $SR \neq RS$; (3 marks)

(ii) $(SR)^T = S^T R^T$. (4 marks)

(b) A quadratic equation has Z and -3 as its roots. Determine its equation. (4 marks)

(c) Differentiate between *floating point* and *fixed point* methods of data representation. (4 marks)

12. (a) Outline **five** advantages of *arithmetic mean* as a measure of central tendency in statistics. (5 marks)

(b) Use the binomial theorem to expand the binomial expression $(x - 2y)^5$. (4 marks)

(c) Given three sets **A**, **B** and **C**, draw a Venn diagram and shade the area representing each of the following:

(i) $A \cup B \cup C$;

(ii) $A \cup (B \cap C)$. (6 marks)

13. (a) Outline the **two** types of skewness in statistics. (2 marks)

(b) Table 1 shows the frequency distribution of weight of patients who attended a hospital. Use it to answer the questions that follow.

Weight in kg	46	48	50	52	54	56	58	60	62
No of Patients	3	5	8	18	27	18	10	8	3

Table 1

Determine each of the following measures about the patient's weight:

I. mean;

II. standard deviation. (5 marks)

(c) Use the substitution method to solve the following set of equations:

$y - 4x = 3$
$y + 3x = 17$ (4 marks)

(d) Table 2 shows lunch preferences for 195 students when taken out for three different trips. Use it to answer the question that follows.

Item Preferred	Number of students		
	Trip 1	Trip 2	Trip 3
Pizza	50	70	91
Hotdog	85	80	76
Hamburger	60	45	28

Table 2

Represent this information in a clustered column chart. (4 marks)

14. (a) With the aid of a sketch, describe the **three** types of kurtosis in statistics. (5 marks)

(b) Use the Pascal's triangle to expand the binomial expression $(2x-5)^4$: (5 marks)

(c) Use the inverse matrix method to solve the following systems of equation:
$3x + 2y = 33$
$5x - 7y = -7$ (5 marks)

15. (a) Define each of the following terms as used in probability:

(i) event;

(ii) outcome;

(iii) sample space. (3 marks)

(b) Given that the universal set is the set of all even numbers less than 30 and sets A= {4,8,12,16,20,24,28}, B= {6,12,18,24,28}.

(i) Use a Venn diagram to represent this information. (3 marks)

(ii) Determine $A \cap B^c$. (2 marks)

(c) (i) A swimming coach intends to choose 3 swimmers from a group of 5. Determine the number of ways the coach can use to choose the swimmers. (3 marks)

(ii) A box contains 3 red, 2 blue and 1 yellow balls. Two balls are drawn at random with replacement. Determine the probability of getting two different colors. (4 marks)

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