THE KENYA NATIONAL EXAMINATIONS COUNCIL

CRAFT CERTIFICATE IN INFORMATION TECHNOLOGY

MODULE I

MATHEMATICS

3 hours

INSTRUCTIONS TO CANDIDATE

You should have 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 **5 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. (a) Describe a linear function giving its general form. (2 marks)

   (b) Convert the number 78_{10} to its binary equivalent. (2 marks)

2. Explain each of the following coding systems as applied in computers:

   (a) ASCII;

   (b) EBCDIC. (4 marks)

3. Using the quadratic formula, solve the equation $y - 6y - 27 = 0$. (4 marks)

4. Use the binomial theorem to expand the expression $(3x - 2)^4$ (4 marks)

5. Describe each of the following types of matrices:

   (a) identity matrix:

   (b) singular matrix. (4 marks)

6. Given matrices $A = \begin{bmatrix} 4 & -2 \\ 1 & -7 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & 2 \\ 6 & -5 \end{bmatrix}$, determine $3A - 4B$. (4 marks)

7. Distinguish between *discreet* and *contiguous* data as used in statistics. (4 marks)

8. Outline **four** advantages of *face* to *face* interview as a data collection method in statistics. (4 marks)

9. A bag contains 5 black balls and 3 red balls. Determine the number of ways in which 5 balls can be selected such that at least 3 of them are black. (4 marks)

10. Use the elimination method to solve the following set of equations:

    $5x + 2y = 41$
    $2x - y = 11$ (4 marks)

SECTION B (60 marks)

Answer any FOUR questions from this section.

11. (a) Describe the term *selection bias* as used in data collection. (2 marks)

    (b) Explain each of the following types of data used in statistics:

    (i) nominal;

    (ii) ordinal. (4 marks)

    (c) Using 2s complement compute the following operation $65 - 5$. (4 marks)

    (d) Use the matrix method to solve the following set of simultaneous equations:
    $2x + 5y = 19$
    $-4x + y = -5$ (5 marks)

12. (a) Define each of the following terms as used in statistics:

    (i) permutation; ~~orde maters~~

    (ii) combination. ~~order das no matt~~ (2 marks)

    (b) Determine the number of ways in which 4 men and 3 women can seat on a bench given that the first person is a man. (3 marks)

    (c) Use the factorization method to solve the equation $3x^2 + x - 10 = 0$: (4 marks)

    (d) State whether each of the following pair of sets is equal or equivalent and justify your answer.

    (i) $A = \{10, 13, 14\}$ and $B = \{1, 2, 3\}$;

    (ii) $C = \{a, b, c\}$ and $D = \{c, a, b\}$. (6 marks)

13. (a) Explain each of the following terms as used in probability:

    (i) experiment;

    (ii) equally likely. (4 marks)

    (b) (i) Given matrix $P = \begin{bmatrix} 2 & 13 & 5 \\ 1 & 8 & 3 \\ 1 & 3 & 1 \end{bmatrix}$ and $Q = \begin{bmatrix} 1 & -2 & 1 \\ -2 & 3 & 1 \\ 5 & -7 & -3 \end{bmatrix}$, show that matrix Q is the inverse of matrix P. (3 marks)

    (ii) Given matrix $A = \begin{bmatrix} 2 & 3 & 4 \\ 5 & 6 & 7 \end{bmatrix}$, $B = \begin{bmatrix} 4 & 5 \\ 6 & 7 \\ 8 & 9 \end{bmatrix}$ and $C = \begin{bmatrix} 2 & 1 & 3 \\ 5 & 6 & 4 \\ 7 & 9 & 8 \end{bmatrix}$ state whether the following matrix operation is possible and justify your answer:

    $AB + CB$. (3 marks)

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

$$y = x^2 + 3x - 2$$
$$y = x + 3$$

(5 marks)

14. (a) Define each of the following terms as used in statistics:
(i)   mode;
(ii)   range;
(iii) mean.

(3 marks)

(b) Distinguish between each of the following symbols as used in set theory:
(i) $\emptyset$ and $\{\emptyset\}$;
(ii) $A \subseteq B$ and $A \subset B$.

(4 marks)

(c) Box A contains 10 bars of chocolate of which 2 are milky and 8 are fruity. Box B contains 12 bars of chocolate of which 4 are milky and 8 are fruity. A bar of chocolate is drawn at random from each box:

(i)   Draw a probability tree diagram to represent these events.

(3 marks)

(ii)   Determine the probability that:

I.   both are milky.

(1 mark)

II.   one fruity and one milky.

(2 marks)

III. at least one milky.

(2 marks)

15. (a) Outline **two** properties of a binomial probability distribution.

(2 marks)

(b) There are 30 students in a class. Eight students are learning both English and French. A total of 18 students are learning English and every student is learning at least one language. Present this information using a Venn diagram showing the total number of students studying French.

(4 marks)

(c) Given the following set of numbers:

10, 6, 19, 14, 3, 1, 5, 4, 11, 6, 13 10, 9, 7, 15

Determine each of the following statistical measures:

(i)   Mean;

(ii)   upper quartile.

(3 marks)

(d)   Table 1 is shows the frequency distribution of heights of 50 students in a class. Use it to answer the questions that follow

Height (cm)	150-154	155-159	160-164	165-169	170-174	175-179
No of Students	4	7	18	11	6	4

Table 1

Determine each of the following measures of the student's height:

(i)   median;

(ii)   standard deviation.   (6 marks)

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