1920/104
MATHEMATICS
July 2016
Time: 3 hours

THE KENYA NATIONAL EXAMINATIONS COUNCIL

CRAFT CERTIFICATE IN INFORMATION TECHNOLOGY

MODULE I

MATHEMATICS

3 hours

INSTRUCTIONS TO CANDIDATES

This paper consists of (FIFTEEN) questions in TWO sections: A and B.
Answer ALL the questions in SECTION A and any FOUR questions in SECTION B in the answer booklet provided.

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.

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SECTION A (40 marks)

*Answer **ALL** questions in this section.*

1. (a) (i) Outline the format of Extended Binary Coded Decimal (EBCD) code. (2marks)

   (ii) Convert 673_{10} to its BCD equivalent. (1 mark)

   (b) State the binomial theorem (assume n is a positive integer). (2 marks)

2. Using the substitution method determine the value of x and y in the following simultaneous equations. (4 marks)

   $$x - 2y = 4$$
   $$x^2 + xy + y = 1$$

3. (a) Determine the equation of the line passing through the points (1, 3) and (3, 7). (3 marks)

   (b) Using a sketch, describe a *Venn diagram* as used in set theory. (2 marks)

4. Differentiate between a *finite set* and an *infinite set* as used in set theory. (4 marks)

5. A bag contains three green and five red balls. A second bag contains four green and six red balls. Two balls are drawn at random one from each bag. Determine the probability that:

   (i) both are green; (2 marks)

   (ii) they are of different colours. (2 marks)

6. Explain each of the following terms giving an example in each case.

   (i) discrete variable; (2 marks)

   (ii) continuous variable. (2 marks)

7. Convert each of the following number to the respective number systems showing your working;

   (i) $DE2FA_{16}$ to its octal equivalent; (2 marks)

   (ii) 360_8 to its hexadecimal equivalent. (2 marks)

8. Outline **two** advantages and **two** disadvantages of using a questionnaire for data collection. (4 marks)

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

   (i) Kurtosis; (2 marks)

   (ii) Skewness. (2 marks)

10. Solve the following set of simultaneous equations using elimination method. (2 marks)

$$2x + 3y = 9$$
$$4x + y = 8$$

SECTION B (60 marks)

*Answer Any **FOUR** questions in this section*

11. (a) Define each of the following terms as used in set theory:

    (i)   subset; (2 marks)

    (ii)   universal set. (2 marks)

  (b) Construct a graph for the equation $y = 3x^2 + 4x - 4$ for $-3 \le x \le 2$ using the grid provided at the end of this paper: (4 marks)

    Hence, solve the equation $y = 3x^2 + 4x - 4$ (2 marks)

  (c) The captain of Kitweli football team is required to choose a committee of 4 members from a team comprising 3 women and 4 men. Determine each of the following:

    (i)   the number of ways the committee could be chosen; (1 mark)

    (ii)   the number of ways in which the committee can be chosen comprising 2 men and 2 women; (2 marks)

    (iii)   the probability that the committee consists of 2 men and 2 women; (2 marks)

12. (a) Explain **three** types of mathematical functions giving an example in each case. (6 marks)

  (b) Using the binomial expansion determine the first four terms in the expansion of

    $(1 - 2y)^8$ in ascending order of y. (2 marks)

    Hence determine the value of 0.98^8 (ii) correct to 4 decimal places. (3 marks)

  (c) Differentiate between *mode* and *median* as used in statistics. (4 marks)

13. (a) Given three matrices; X is a 2 X 3 , Y is a 2 X 2 and Z is a 3 X 2;

    (i)   identify possible matrix products from the following;

       XY, YX , XZ and YZ. (4 marks)

    (ii)   State the size of the resultant matrix from the matrix product identified in (i). (2 marks)

(b) Table 1 shows the frequency distribution of age of people attending nutrition clinic. Use it to answer the questions that follow.

Age(Years)	1–10	11–20	21–30	31–40	41–50	51–60	61–70	71–80	81-90	Over 91
Frequency	2	5	9	12	25	37	11	6	2	1

Table 1

(i) construct an Ogive to represent this information on the grid provided at the end of this paper. (4 marks)

From the graph drawn in (i), estimate each of the following measures;

(ii) the median age; (1 mark)

(iii) the interquartile range. (2 marks)

(c) The difference of set A and B is defined as A – B. Using a Venn diagram present this information. (2 marks)

14. (a) Define with words each of the following types of matrices.

(i) singular matrix; (2 marks)

(ii) unit matrix; (2 marks)

(iii) inverse of a matrix. (2 marks)

(b) A certain college with a student population of 500 offers two courses, Food technology and Applied biology. The student population is as shown in table 2. Use it to answer the questions that follow.

Course	Male	Female
Food Technology	100	160
Applied Biology	200	40

Table 2

(i) A student who takes Applied Biology is selected at random from college, determine the probability that she is a female. (2 marks)

(ii) A male student is selected at random from the college, determine the probability that he takes Food Technology. (2 marks)

(c) Table 3 shows the weight distribution of children taken for clinic in a certain hospital. Use it to answer the questions that follow.

Weight in kgs	1 - 6	7 - 12	13 - 18	19 - 24	25 - 30
Number of children	23	15	37	15	10

Table 3

Determine each of the following measures about the weight of the children:

(i)   the mean;   (2 marks)

(ii)   the standard deviation.   (3 marks)

15. (a) Given that $M = \begin{bmatrix} 1 \\ 5 \end{bmatrix}$ and $N = \begin{bmatrix} -2 \\ 4 \end{bmatrix}$, determine $3M - 2N$.   (3 marks)

(b) Three girls Eva, Kate and Milli went for lunch. Eva took a soda, a sandwich and a banana. Kate took two cups of tea and a sandwich while Milli took a soda, a sandwich and two bananas. The prices of a bottle of soda, a sandwich a cup of tea and a banana are ksh. 25, ksh. 40 , ksh. 30 and ksh. 10 respectively;

    (i)   Present this information in two matrices in terms of the type of food each girl took and the prices.   (2 marks)

    (ii)   Determine the amount each girl paid.   (3 marks)

(c) Explain each of the following terms as used in representation of numerical data:

    (i)   fixed point;   (2 marks)

    (ii)   floating point.   (2 marks)

(d) Peter, the mathematics lecturer advised the students not to use calculators during the lesson. Outline **three** challenges that could have led to his decision.

    (3 marks)

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