1920/104
MATHEMATICS
July 2017
Time: 3 hours

THE KENYA NATIONAL EXAMINATIONS COUNCIL

CRAFT CERTIFICATE IN INFORMATION TECHNOLOGY

MATHEMATICS

3 hours

INSTRUCTIONS TO THE CANDIDATE

You should have the following for this examination:

- *Scientific calculator;*
- *Statistical tables;*
- *Geometrical set;*
- *Graph paper provided / attached in the answer booklet;*
- *Answer booklet.*

*This paper consists of **TWO** sections, **A** and **B**.*
*Answer **ALL** the questions in section **A** and any **FOUR** questions from section **B** in the answer booklet provided.*
Candidates 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 in this section.*

1. Define each of the following terms as used in matrices:
   (i) diagonal matrix;
   (ii) identity matrix. (4 marks)
2. Describe each of the following number systems:
   (i) hexadecimal;
   (ii) octal. (4 marks)
3. Outline **four** properties of *Poisson probability* distribution. (4 marks)
4. Explain each of the following terms as used in statistics:
   (i) discrete random variable;
   (ii) continuous random variable. (4 marks)
5. Distinguish between *explicit function* and *quadratic function* as used in mathematics. (4 marks)
6. Convert each of the following decimal numbers to their respective equivalents:
   (i) 7042_{10} to excess-3 code;
   (ii) 389_{10} to BCD. (4 marks)
7. Using binomial theorem, expand the expression $(x^2 + 3)^6$ up to the fourth term in descending powers of x. (3 marks)
8. (a) Recently, multimedia systems have become very popular among college students. Outline **two** ways students could use these systems to improve their mathematical skills. (2 marks)
   (b) The quadratic equation $2x^2 + (p + 1)x + q - 2 = 0$ has its roots as -3 and ½ . Determine the value of p and q in the equation. (2 marks)
9. A researcher carried out a survey about car and motorbike ownership on 500 university students. It was found out that 123 students own motorbikes, 91 own cars while 29 own both.
   (i) Draw a Venn diagram to represent this information. (3 marks)
   (ii) Determine the percentage of students who own a motorbike or a car. (2 marks)
10. Use the graphical method to solve the equation $3x^2 - 8x - 5 = 0$ for $-1 \leq x \leq 4$ (4 marks)

SECTION B (60 marks)

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

11. (a) Explain **three** ways in which a researcher could classify statistical data. (6 marks)

(b) Given two matrices $\mathbf{A} = \begin{bmatrix} 7 & -8 & 5 \\ -4 & 5 & -3 \\ 1 & -1 & 1 \end{bmatrix}$ and that $\mathbf{B} = \begin{bmatrix} 2 & 2 & -1 \\ 1 & 2 & 1 \\ -1 & -1 & 3 \end{bmatrix}$, show that $\mathbf{AB} = \mathbf{I}$. (3 marks)

(c) Mwariki motorbike dealers assemble its products in two plants; one in Nairobi and another in Nakuru. The Nairobi plant assembles 60% of the motorbikes. It has been found out that 4 % of the Nairobi motorbikes are defective as well as 5% from Nakuru.

(i) Use a tree diagram to present this information; (2 marks)

(ii) Determine the probability that a bike selected at random is defective and comes from Nairobi. (2 marks)

(iii) Determine the probability that a bike selected at random is not defective. (2 marks)

12. (a) Describe each of the following in words:

(i) $\{x \mid x \rangle 0 \text{ and } x \in \Re\}$:

(ii) $\{Birds \mid \text{the bird is a mammal}\}$. (4 marks)

(b) Solve each of the following inequalities:

(i) $-2(x-3) < 5(x+1) - 12$;

(ii) $-3 < \frac{3}{2}(2-x) \leq 5$. (6 marks)

(c) Table 1 shows the price of various products in supermarkets M and N. Use it to answer the questions that follow.

Item	Supermarket	
	M	N
Sugar	Kshs 230 per kg	Kshs 250 per kg
Flour	Kshs 125 per pct	Kshs 140 per pct
Oil	Kshs 455 per Ltr	Kshs 425 per Ltr

Table 1

Lucy intends to buy 5 Kgs of sugar, 6 packets of flour and 3 litres of oil.

(i) Represent this information in matrix form showing the price and item matrices. (2 marks)

(ii) Determine the total cost of the items from each supermarket using the matrix method. (3 marks)

13. (a) Outline **three** properties of a *binomial* experiment in statistics. (3 marks)

(b) With the aid of a diagram in each case, differentiate between *positive skewness* and *negative skewness* as used in measures of dispersion. (4 marks)

(c) Use the cofactor method to determine the inverse of the following matrix:

$$D = \begin{bmatrix} 4 & 1 & 2 \\ -2 & 2 & 4 \\ 2 & 5 & 4 \end{bmatrix}$$ (8 marks)

14. (a) Explain each of the following coding systems, outlining the format for representing a character:

(i) Extended Binary Coded Decimal Interchange Code;

(ii) American Standard Code for Information Interchange. (4 marks)

(b) Three matrices are defined by the following matrix sizes:

matrix **A** : 3×4 ; matrix **B** : 4×5 and matrix **C** : 4×4

Determine which of the following operations are possible giving a reason for your answer;

(i) **AB**;

(ii) **BC**;

(iii) **CA**. (6 marks)

(c) Table 2 shows the time taken (in minutes) by one hundred and twenty athletes to complete a race in a competition. Use it to answer the questions that follow.

Time taken	31 - 35	36 - 40	41 - 45	46 - 50	51 - 55	56 - 60
No of Athletes'	17	24	19	28	19	13

Table 2

Determine each of the following measures about the time taken to complete the race:

(i) mean; (2 marks)

(ii) standard deviation. (3 marks)

15. (a) Given that U= $\{mangoes, oranges, pineapple, watermelon, kiwi, apple, Tangerine\}$
If A= $\{mangoes, oranges, pineapple, watermelon, kiwi\}$ and B= $\{Kiwi, apple, Tangerine\}$

Determine each of the following:

(i) $A^c \cup B$;

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

(b) The following data shows the age of 42 people who attended and were treated at a medical camp. Use it to answer the questions that follow.

26	16	21	34	45	18	41	38	22	48	27	22	30	20
39	62	25	25	38	29	31	28	20	56	60	24	61	23
28	32	33	18	23	27	46	30	34	62	49	59	19	24

(i) Create a *grouped frequency distribution* with six classes having uniform class interval with the first class starting at the lowest point. (HINT: Take age as discrete) (4 marks)

(ii) Construct a cumulative percentage frequency polygon for (i). (3 marks)

(c) Two hundred people applied for a sales job that was advertised by a certain company. Of the total applicants, sixty were women. If two people were selected at random, calculate the probability that:

(i) both were women;

(ii) one was a woman. (4 marks)

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