

1920/104

MATHEMATICS

November 2017

Time: 3 hours



THE KENYA NATIONAL EXAMINATIONS COUNCIL
CRAFT CERTIFICATE IN INFORMATION TECHNOLOGY
MATHEMATICS

3 hours**INSTRUCTIONS TO THE CANDIDATE**

You should do the following for this examination:

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

*This paper consists of **TWO** sections.*

*Answer **ALL** the questions in section **A** and any **FOUR** questions in section **B** in the answer booklet provided.*

Candidates should answer the questions in English.

This paper consists of 6 printed pages.

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

SECTION A (40 marks)

Answer ALL the questions in this section.

1. Outline **three** properties of the *standard deviation* as a measure of dispersion. (3 marks)
2. (a) Given two sets, $K = \{1, 2, 3\}$ and $L = \{1, 3, 6, 5\}$, determine $K - L$. (2 marks)
- (b) Distinguish between a *finite* set and an *infinite* set as used in set theory. (2 marks)
3. Using the co-factor method, determine the determinant of the matrix X :

$$X = \begin{bmatrix} 6 & 2 & 3 \\ -2 & 5 & 4 \\ 3 & -2 & 1 \end{bmatrix} \quad (4 \text{ marks})$$

4. (a) State the binomial theorem, using mathematical notation taking n as a positive integer. (2 marks)
- (b) Outline **two** challenges that would be faced by end user organizations as a result of new statistical applications in the market. (2 marks)
5. Using the elimination method, solve the following set of simultaneous equations:

$$\begin{aligned} 3x + 5y &= 27 & = x - 2y &= 26 \\ 2x - 3y &= -1 \end{aligned} \quad (4 \text{ marks})$$

6. Explain each of the following terms as used in mathematics, giving an example in each case:
 - (a) discrete variable;
 - (b) continuous variable. (4 marks)
7. The following is the monthly budget of a certain company. Use it to answer the question that follows:

Item	Amount (Ksh '000')
Wages	150
Materials	125
Sales and marketing	80
Miscellaneous	45

$\frac{3}{150,000} \times 360^\circ = 135^\circ$
 $= \frac{400,000}{8}$

- Present this information using a pie chart. (4 marks)
8. Define each of the following functions as used in mathematics giving an example of each:
 - (a) explicit function;
 - (b) implicit function. (4 marks)

9. (a) Outline **three** methods used in statistical data collection. (3 marks)
- (b) Define the term *range* as a measure of dispersion. (2 marks)
10. Convert each of the following number systems to their respective equivalents:
- (a) $A2DBE_{16}$ to binary; (2 marks)
- (b) 10110101_2 to octal. (2 marks)

No. of cars	0	1	2	3	4
Probability	0.1	0.2	0.3	0.2	0.1

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

11. (a) Explain each of the following types of matrices, giving an example of a 3 X 3 matrix in each case:
- (i) diagonal matrix;
 - (ii) scalar matrix. (4 marks)

- (b) Julius has established the following probability distribution for the cars he expects to sell on a particular day of the week as shown in table 1. Use it to answer the questions that follow.

No. of cars	0	1	2	3	4
Probability	0.1	0.2	0.3	0.3	0.1

Table 1

Determine each of the following about the number of cars sold:

- (i) the probability of selling at least 3 cars; (1 mark)
 - (ii) the standard deviation of the number of cars sold. (6 marks)
- (c) Using the Pascal's triangle, evaluate the expansion $(2x - 3y)^5$ in descending powers of x. (4 marks)
12. (a) Explain **two** advantages of using graphs in statistical data representation. (4 marks)
- (b) Given the following matrices,

$$\mathbf{R} = \begin{bmatrix} 6 & 1 & 4 \\ -1 & 0 & 3 \end{bmatrix}, \mathbf{S} = \begin{bmatrix} 0 & 1 & 2 \\ 5 & 4 & -3 \\ 3 & 6 & -4 \end{bmatrix} \text{ and } \mathbf{T} = \begin{bmatrix} 4 & -3 & 6 \\ 1 & 2 & 5 \\ 0 & -1 & 3 \end{bmatrix}$$

Determine each of the following:

- (i) **RS** (2 marks)
 - (ii) $3(\mathbf{T} + \mathbf{S})^T$ (3 marks)
- (c) A certain factory employs 500 men. In a given year, 20% of all employees had a minor accident of whom, 30% read safety instructions, among all employees 60% did not read the safety instructions.
- (i) present this information using a contingency table of frequencies;
 - (ii) determine the probability of an employee being accident-free given that he had:
 - (I) not read safety instructions; (2 marks)
 - (II) read safety instructions. (4 marks)

13. (a) With the aid of a diagram, define the term *complement of a set* as used in set theory. (3 marks)
- (b) A researcher conducted a survey on beverage consumption by people who attended a party on three types of beverages: tea, coffee and water and the following data was obtained. 55 drank tea, 45 drank coffee and 39 drank water. Further, 19 drank tea and water, 15 drank coffee and tea, 14 drank coffee and water while 4 drank tea, coffee and water. Everybody took at least a drink.
- (i) Use a Venn diagram to present this information; (4 marks)
- (ii) Determine the number of people who drank:
- (I) tea only;
- (II) coffee or water but not tea. (4 marks)
- (c) Using the graphical method, solve the following set of simultaneous equations:
- $$3y + 2x = 12$$
- $$y = x - 1$$
- (4 marks)
14. (a) Describe each of the following computer coding systems:
- (i) BCD;
- (ii) ASCII. (4 marks)
- (b) With the aid of a diagram in each case, differentiate between *negative skewness* and *positive skewness*. (6 marks)
- (c) Given the following matrices, $\mathbf{A} = \begin{bmatrix} 2 & 3 \\ 5 & 7 \end{bmatrix}$, $\mathbf{B} = \begin{bmatrix} 1 & 4 \\ 5 & 6 \\ 2 & 4 \end{bmatrix}$ and $\mathbf{C} = \begin{bmatrix} 3 & 5 & 12 \\ 4 & 6 & 8 \\ 3 & 4 & 9 \end{bmatrix}$,
- State whether each of the following matrix operations are possible or not giving a reason where not possible:
- (i) $\mathbf{C} \times \mathbf{B}$;
- (ii) $\mathbf{B} + \mathbf{A}$;
- (iii) $\mathbf{C} \times \mathbf{A}$. (5 marks)
15. (a) With the aid of a diagram, describe the *three* curves of kurtosis. (4 marks)
- (b) Using the binomial theorem, evaluate the expression $(1.002)^9$ correct to 5 decimal places. (3 marks)

- (c) The data in Table 2 represents the frequency distribution of marks of students who sat for an exam in the year 2016. Use it to answer the questions that follow.

Marks	0 -9	10 - 19	20 -29	30-39	40-49	50-59	60-69	70-79	80-89	90-99
No of students	2	4	12	20	35	45	33	15	8	1

Table 2

Determine the following measures about the distribution of marks:

- (i) median;
- (ii) inter quartile range;
- (iii) standard deviation.

(8 marks)

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