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Name_____   Index No._____/_____

1920/104   Candidate's Signature _____
MATHEMATICS
July 2015   Date_____
Time: 3 hours

THE KENYA NATIONAL EXAMINATIONS COUNCIL

CRAFT CERTIFICATE IN INFORMATION STUDIES

MATHEMATICS

3 hours

For Examiner's Use Only

Section	Question	Maximum score	Candidate's score
A	1 - 10	40	
B	11	15	
	12	15	
	13	15	
	14	15	
	15	15	
	Total score		

This paper consists of 16 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 in the spaces provided.*

1. State **three** properties of a binomial probability distribution. (3 marks)

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2. A farmer intends to plant potatoes on a 40 acre piece of land, maize on a 25 acre piece and wheat on a 30 acre piece. The cost of seeds for an acre of potatoes, maize and wheat is Ksh 400, Ksh 300 and Ksh 500 respectively.

   (i) Using a row vector and column vector for acreage and cost respectively, represent this information. (2 marks)

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   (ii) Determine the total cost of seeds for the three pieces of land. (2 marks)

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3. Compute each of the following using binary arithmetic; (2 marks)

   (a) $23_{10} - 7_{10}$ using one's complement;

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(b) $8_{10} - 3_{10}$ using two's complement. (2 marks)

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4. Using matrix method, solve the following set of simultaneous equations. (4 marks)
$$5x - 2y = 2$$
$$4x + y = 4$$

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5. (a) Outline **two** properties of arithmetic mean using words. (2 marks)

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(b) A mathematics teacher intends to make a multiple-choice test. She wants to give each student the same questions, but have each student's questions appear in a different order. If there are twenty-seven students in the class, determine the least number of questions the quiz could contain.

(3 marks)

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6. With the aid of a sketch, explain the term *kurtosis* as used in measures of dispersion. (4 marks)

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7. Differentiate between *discrete* and *continuous* data types as used in statistics. (4 marks)

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8. (a) Table 1 shows the probability distribution of the commission earned by a salesperson. Determine the expected commission earned by a salesperson. (2 marks)

Commission in Ksh	0	1000	2000	3000	4000
Probability	0.05	0.15	0.25	0.45	0.1

Table 1

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(b) Using binomial expansion determine the first **four** terms in the expansion of $(1-2x)^8$ in ascending powers of x. (3 marks)

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9. Determine each of the following for matrix $A = \begin{bmatrix} 5 & -7 \\ 3 & 2 \end{bmatrix}$

(i) A^{-1} (2 marks)

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(ii) $A^{T}A$ (2 marks)

10. Using elimination method, solve the following set of simultaneous equations. (3 marks)

$$3x + 2y = 5$$
$$2x + 3y = 4$$

SECTION B (60 marks)

Answer any FOUR questions in this section in the spaces provided.

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

(i) identity matrix;

(2 marks)

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(ii) singular matrix;

(2 marks)

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(iii) orthogonal matrix.

(2 marks)

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(b) Table 2 shows breakfast menu in that customer may choose an item from each of the groups. Use it to answer the questions that follow.

Breakfast Sandwich	Accompaniments	Juice
Beef burger chicken burger vegetable burger	breakfast potatoes apple slices fresh fruit cup pastry	orange cranberry tomato apple grape

Table 2

Determine the number of different breakfast choices that a customer;

(i)   can order;   (1 mark)

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(ii)   can order without meat.   (2 marks)

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(c)   Given $n(U)=169$, $n(A)=81$, and $n(B)=66$

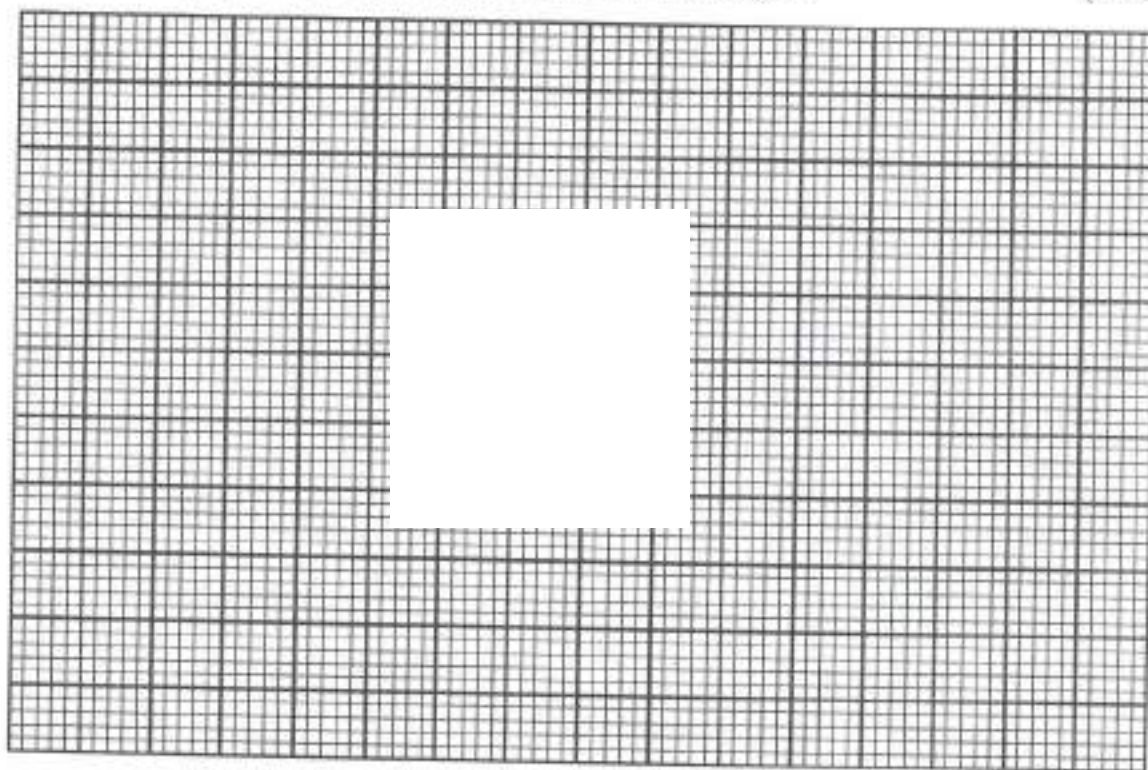(i)   Determine $n(A \cap B)$ if $n(A \cup B)=137$ (3 marks)

(ii)   Draw a Venn diagram to represent the composition of the universal set.   (3 marks)

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12. (a) Convert the number 46_{10} to its excess-3 code equivalent. (2 marks)

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(b) Construct a graph to represent the linear inequality $2x + y \leq 6$ (3 marks)

(c) Explain each of the following measures as used in statistics:

(i) arithmetic mean; (2 marks)
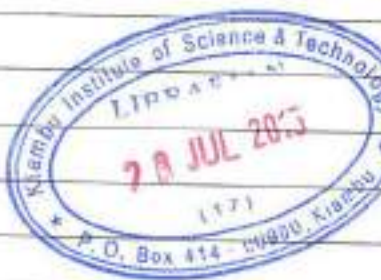
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(ii) standard deviation; (2 marks)

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(iii) quartiles. (2 marks)

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(d) Given that function $g(x) = x^2$, determine each of the following:

(i) $g(2x) - 1$; (2 marks)

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(ii) $g(-5)$. (2 marks)

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13. (a) Define each of the following computer coding systems:

(i) ASCII; (2 marks)

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(ii) GRAY. (2 marks)

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(b) Given that matrix $A = \begin{bmatrix} 7 & 1 \\ -3 & 2 \end{bmatrix}$, show that $A^{-1} = \begin{bmatrix} 2/17 & -1/17 \\ 3/17 & 7/17 \end{bmatrix}$ (3 marks)

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(c) Table 3 shows marks scored by 42 students in one subject. Use it to answer the questions that follow.

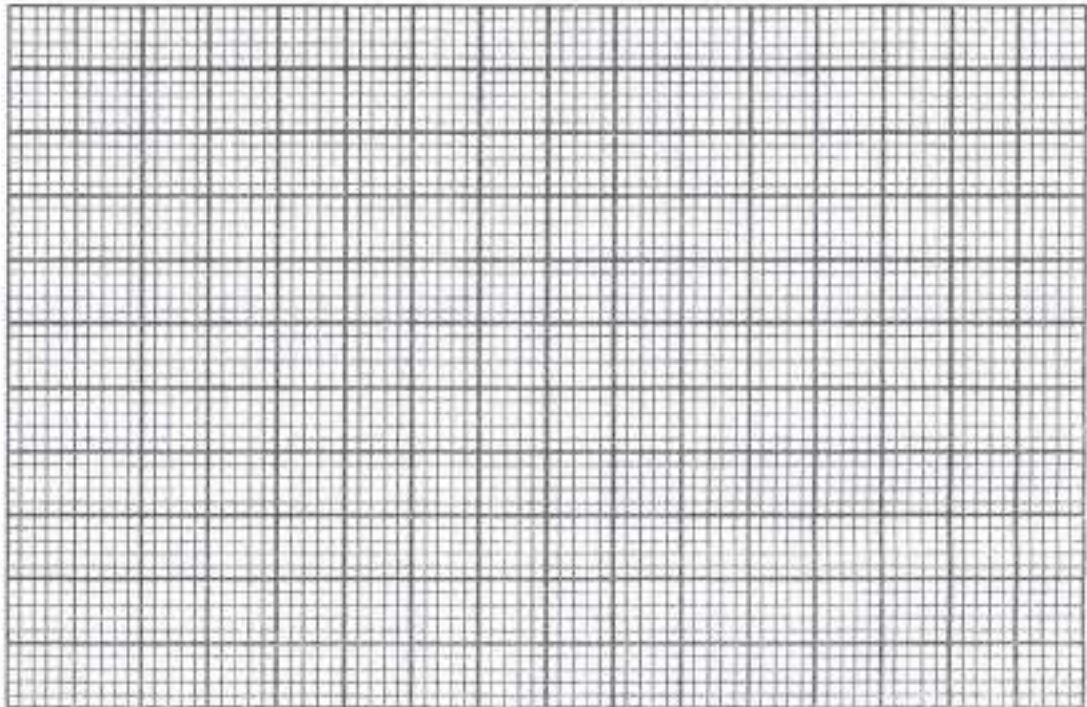| 35 | 40 | 56 | 41 | 64 | 73 | 49 | 80 | 58 | 70 |
46	25	69	86	36	68	64	41	57	47
62	73	54	61	58	81	49	65	74	56
75	67	46	59	33	57	48	63	26	72
51	28								

Table 3

(i) Construct a frequency distribution table with class interval of 10, and starting at mark 25;   (3 mark)

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(ii)   Draw the Ogive for the data;   (3 marks)

(iii) Estimate each of the following measures using the graph in (ii):

       I.   the median mark;   (1 mark)

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_____   _____

       II.   the inter quartile range mark.   (1 mark)

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14. (a) Explain each of the terms as used in statistics:

         (i)   mutually exclusive events;   (2 marks)

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         (ii) independent events.   (2 marks)

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(b) Convert each of the following numbers to their respective equivalents:

(i) 253_8 to hexadecimal; (2 marks)

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(ii) 1808_{10} to octal. (2 marks)

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(c) Given the following matrices, $X = \begin{bmatrix} 3 & -2 \\ 4 & 1 \end{bmatrix}$ $Y = \begin{bmatrix} 1 & 5 \\ 0 & -7 \end{bmatrix}$

Show that $XY \neq YX$ (4 marks)

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(d)   A line passes through the points (6,8) and (12,4). Determine the equation of the line.

(3 marks)

15.   (a)   State the binomial theorem using mathematical notation.

(3 marks)

(b)   Using a Venn diagram identify each of the following set operations.
       (i) $X \cap Y$;

(2 marks)

(ii) $X \cup Y$:

(2 marks)

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(iii) X^c.

(2 marks)

(c) Kipande Company Ltd manufactures bulbs in two regions, Western and Eastern. The Eastern region manufactures 60 % of the bulbs of which 4% are defective and 5% Western region bulbs are defective.

(i) Using a tree diagram, represent this information.

(4 marks)

(ii) Determine the probability that a bulb chosen at random is defective. (2 marks)