1920/103
BASIC ELECTRONICS
July 2018
Time: 3 hours

THE KENYA NATIONAL EXAMINATIONS COUNCIL

CRAFT CERTIFICATE IN INFORMATION TECHNOLOGY

BASIC ELECTRONICS

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** from **section B** in the answer booklet provided.*
Candidate should answer the questions in English.

This paper consists of 4 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. Outline **four** acceptors elements that would form a *p-type* region when a semiconductor is doped. (4 marks)

2. Draw a closed circuit of three inductors (L_1, L_2 and L_3) in series, showing the current (I) flow and voltage (V_1, V_2 and V_3) across each inductor. (4 marks)

3. Determine the arithmetic operation $\mathbf{3\,4\,5_8 + 4\,3\,F_{16}}$ leaving the answer in decimal equivalent (4 marks)

4. Explain **two** characteristics of a *Static Random Access Memory*. (4 marks)

5. Modern computers use ROM in the manufacture of their memories. Explain **two** primarily uses of ROM. (4 marks)

6. Explain **two** application areas of gray code in computers. (4 marks)

7. (a) Computer designers prefers using hexadecimal number system. State **two** reasons for this. (2 marks)

   (b) Define each of the following terms as used in electrical circuits:

   (i) overcurrent; (1 mark)

   (ii) wattage. (1 mark)

8. Calculate each of the following octal arithmetic:

   (i) 2 3 4 – 1 3 7; (2 marks)

   (ii) 6 5 4 + 2 1 6. (2 marks)

9. With the aid of a sketch, implement an AND with two inputs using NAND logic gates. (4 marks)

10. Determine the Excess – 3 equivalent of each of the following decimal numbers.

    (i) 147; (2 marks)

    (ii) 2543. (2 marks)

SECTION B (60 marks)

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

11. (a) (i) Outline **four** examples of Read Only Memory. (4 marks)

(ii) The rapid development of electronic components has changed the face the electronic world. Explain **two** emerging trends of such electronic components in the society. (4 marks)

(b) (i) Using BCD, evaluate 91 + 79. (3 marks)

(ii) Differentiate between *power* and *energy* as used in electrical circuits. (4 marks)

12. (a) (i) Explain **two** primary bonds that could be found in a semiconductor. (4 marks)

(ii) Differentiate between *electrical conductivity* and *electrical resistivity* as used in D.C circuits. (4 marks)

(b) (i) Figure 1 represents a logic gate. Draw the truth table of the logic gate. (3 marks)

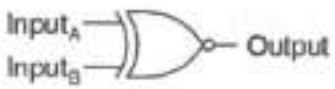

Figure 1

(ii) Figure 2 represent a closed. Use it to answer the following questions.

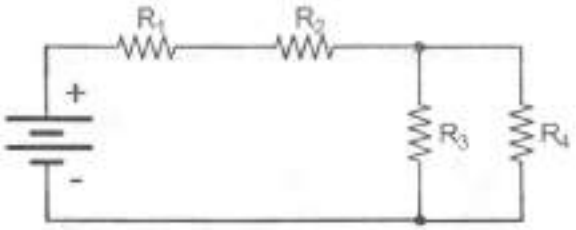

Figure 2

(I) Determin the total resistance in the circuit givent that $R_1 = 10\ \Omega$, $R_2 = 60\ \Omega$, $R_3 = 50\ \Omega$ and $R_4 = 40\ \Omega$. (3 marks)

(II) Describe the flow of current in the resistors R_3 and R_4. (1 mark)

13. (a) Table 1 represent a truth table for a logic circuit. Use it to answer the questions that follow.

A	B	C	L
0	0	0	0
0	0	1	0
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	1

Table 1

(i) Derive the Boolean expression for the sum of products. (2 marks)

(ii) Use a K-map to simplify the Boolean expression. (4 marks)

(b) (i) Explain **three** circumstances under which two's complement is required in computer use. (6 marks)

(ii) Distinguish between *electrode* and *electrolyte* as used in batteries. (3 marks)

14. (a) (i) Define the term *impedance* as used in electronics. (2 marks)

(ii) Convert the following decimal equivalent to their BCD numbers.

(I) 598 (2 marks)

(II) 96.72 (2 marks)

(b) (i) Evaluate the binary arithmetic $D_{16} * 3_{8}$ to its octal equivalent. (4 marks)

(ii) Simply the boolean function using the boolean algebra laws. (5 marks)

$$F = \bar{A}BC + A\bar{B}C + AB\bar{C} + ABC + ABC + ABC$$

15. (a) (i) Outline **three** disadvantages of integrated circuits. (3 marks)

(ii) Draw a closed circuit with two batteries and three resistors (R_1, R_2, and R_3) in parallel showing the flow of current. (5 marks)

(b) (i) Figure 3 represents an atom structure of an element **X**. Identify the part labelled I, II, III and IV. (4 marks)

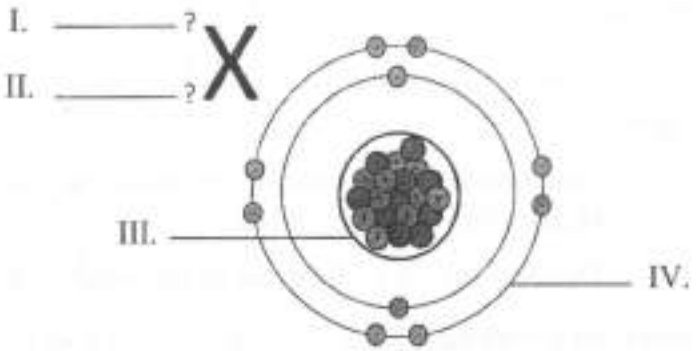

Figure 3

(ii) Explain each of the following terms as applied in batteries:

(I) float charging; (1½ marks)

(II) memory effect. (1½ marks)

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