

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.**

## 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  $345_8 + 43F_{16}$  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** primary 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)  $234 - 137$ ; (2 marks)
  - (ii)  $654 + 216$ . (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.

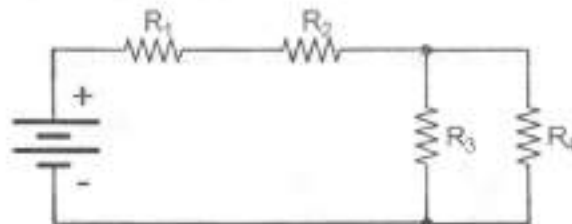


Figure 2

- (I) Determine the total resistance in the circuit given 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)

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

- 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)

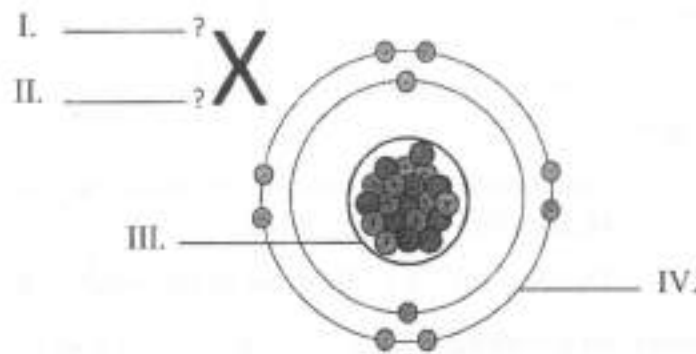


Figure 3

- (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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