

1920/103  
BASIC ELECTRONICS  
July 2021  
Time: 3 hours



THE KENYA NATIONAL EXAMINATIONS COUNCIL  
CRAFT CERTIFICATE IN INFORMATION TECHNOLOGY

BASIC ELECTRONICS

3 hours

**INSTRUCTIONS TO CANDIDATES**

**This paper consists of section A and B.**

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

*Candidates 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** application areas of Gray code number systems. (4 marks)
2. Explain each of the following terms used in basic electronics:
  - (i) logic gate; (2 marks)
  - (ii) 8421 BCD. (2 marks)
3. With the aid of a symbol, describe a photodiode as used in electronics. (4 marks)
4. Determine the hexadecimal equivalent of the following number systems.
  - (i)  $1001111111101000_2 = 4ED8_{16}$  (2 marks)
  - (ii)  $0.06640625_{10} = 0.0A_{16}$  (2 marks)
5. Describe **two** physical parts of an internal computer hard disk. (4 marks)
6. ✓ Differentiate between *donor* and *acceptor atoms* as applied in semiconductors. (4 marks)
7. Define each of the following terms as used in basic electronics:
  - (i) neutron; (1 mark)
  - (ii) conductivity; (1 mark)
  - (iii) inductance; (1 mark)
  - (iv) impedance. (1 mark)
8. ✓ Determine the decimal equivalent of each of the following numbers.
  - (i)  $756_8$  (2 marks)
  - (ii)  $89.4_{16}$  (2 marks)
9. Figure 1 represents a close electrical circuit. Use it to answer the question that follows.

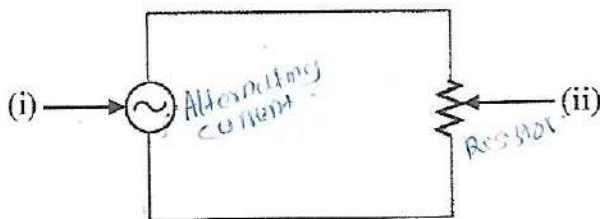


Figure 1

Explain the function of the parts labelled (i) and (ii). (4 marks)

10. Explain **two** advantages of Excess-3 code. (4 marks)

SECTION B (60 marks)

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

11. (a) (i) With the aid of a diagram, describe the depletion layer of a p-n junction. (4 marks)
- (ii) Distinguish between *energy* and *power* as used in electronics. (3 marks)
- (b) (i) Outline **three** circumstances that would necessitate the use of inductors in electrical circuits. (3 marks)
- (ii) Evaluate each of the following numbers, show your working.
- I.  $10001111_2 + 10101111_2$  (2 marks)
- II.  $1011_2 \times 1010_2$  (3 marks)

12. (a) (i) Employees of a certain company were asked to discuss the trends of computer memory since the fourth generation of computers. Outline **three** such trends. (3 marks)
- (ii) Calculate each of the following octal arithmetic.
- I.  $134_8 \div 654_8$  (1 ½ marks)
- II.  $2712_8 - 1517_8$  (1 ½ marks)
- (b) (i) A student intends to determine the factors which affect the resistance of a conductor. Explain **two** such factors. (4 marks)

- (ii) Draw a logic circuit for the following Boolean equation.

$$Y = \overline{A}BC + A\overline{B}C + \overline{A}B\overline{C}$$

(5 marks)

13. (a) (i) Outline **three** disadvantages of using flash memory. (3 marks)
- (ii) A cable of length 4 kilometres has a cross-sectional area of  $2 \times 10^{-6} \text{ m}^2$  and conductivity of  $8 \times 10^{-6} \text{ S/m}$ . Determine the resistance of the cable. (4 marks)

- (b) (i) Figure 2 represent a closed circuit with three resistors of  $R_1(10 \Omega)$ ,  $R_2(15 \Omega)$ ,  $R_3(12 \Omega)$  and a current of 20A. Use it to answer the question that follows.

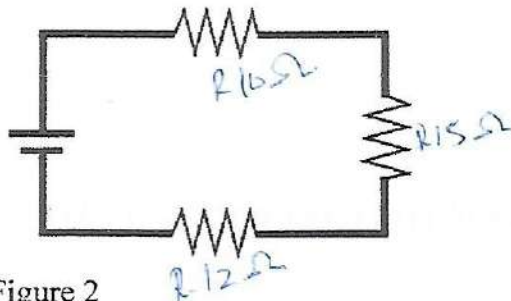


Figure 2

Determine the total voltage across the circuit. (4 marks)

- (ii) Calculate  $456 + 891$  using BCD arithmetic. (4 marks)

Series  $\frac{1}{R_1} + \frac{1}{R_2}$   
 Parallel  $R_T = R_1 + R_2 + \dots$   
 $I = \frac{V}{R}$   
 $V = I \times R$

14. (a) (i) List **four** types of capacitors. (2 marks)
- (ii) Explain the following terms as used in computer storage:
- I. byte; (2 marks)
- II. density. (2 marks)
- (b) (i) Expand the general expression to Sum of Product form.  

$$F = ABC\bar{C} + \bar{A}B + BCD$$
 (5 marks)
- (ii) Convert each of the following number systems into their octal equivalent.
- I.  $617_{16}$  (2 marks)
- II.  $109_{10}$  (2 marks)
15. (a) (i) Outline **three** application areas of holographic memory in computers. (3 marks)
- (ii) Explain **two** circumstances that would necessitate the use of PNP transistors. (4 marks)
- (b) (i) Simplify the Boolean expression using Karnaugh map.  

$$Y = \bar{A}\bar{B}\bar{C} + ABC + \bar{A}BC + \bar{A}BC + ABC$$
 (5 marks)
- (ii) Draw the symbols for each of the following as used in electricity:
- I. battery; (1 mark)
- II. open switch; (1 mark)
- III. potentiometer. (1 mark)

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