1920/103
BASIC ELECTRONICS
March/April 2023
Time: 3 hours
BASIC ELECTRONICS

THE KENYA NATIONAL EXAMINATIONS COUNCIL

CRAFT CERTIFICATE IN INFORMATION TECHNOLOGY

BASIC ELECTRONICS

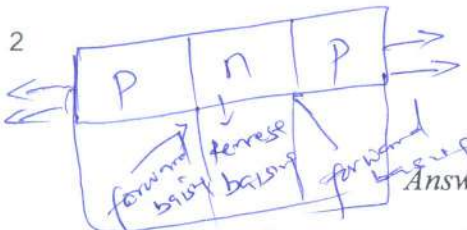
3 hours

INSTRUCTIONS TO CANDIDATES

*This paper consists of section **A** and **B**.*
*Answer **ALL** the questions in 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** questions in this section.*

1. Outline **four** disadvantages of an Integrated Circuit (IC). (4 marks)

2. With the aid of a diagram, outline the circuit symbol for a PNP transistor showing the flow of current and the voltages. (4 marks)

3. Using one's complement, calculate 11100001_2 - 10101111_2. (4 marks)

4. Draw the truth table for the OR logic gate. (4 marks)

5. Explain **two** advantages of Cache memory in computers. (4 marks)

6. Evaluate the following arithmetic, leaving the answer in octal number system.

   (i) $11101100_2 - 10111000_2$ (2 marks)

   (ii) $BC_{16} + 57_8$ (2 marks)

7. With the aid of a diagram, outline the electronic configuration of silicon. (4 marks)

8. Determine the Excess-3 equivalent for each of the following decimal numbers.

   (i) 71.6_{10} (2 marks)

   (ii) 945_{10} (2 marks)

9. Explain **two** disadvantages of using hexadecimal number systems. (4 marks)

10. Figure 1 represents a closed electric circuit of capacitors C_1 (0.6 µF), C_2 (0.3 µF) and C_3 (0.9 µF) and a charge of 10 Coulomb. Use it to answer the question that follows.

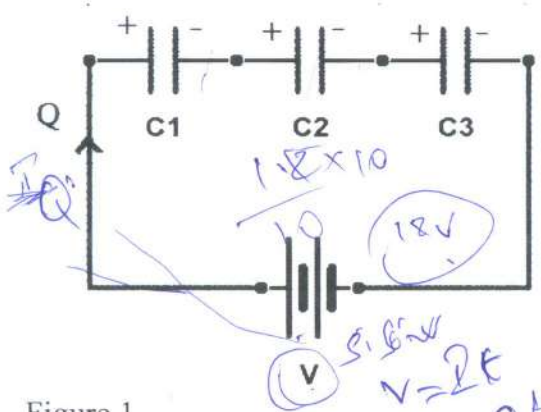


Figure 1

Determine the voltage in the circuit. (4 marks)

SECTION B (60 marks)

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

11. (a) (i) Define each of the following terms as used in basic electronics:

I. energy; (1 mark)

II. amplitude; (1 mark)

III. power dissipation. (1 mark)

(ii) Explain **two** characteristics of ROM as used in computers. (4 marks)

(b) (i) Using Karnaugh map, simplify the minimal terms using four variables (ABCD).

$\sum$**m (0, 2, 8, 10, 12)** (4 marks)

(ii) Using BCD, determine $81_{10} + 77_{10}$. (4 marks)

12. (a) (i) Outline **three** regions where a bipolar transistor has the ability to operate. (3 marks)

(ii) Differentiate between *weighted code* and *non-weighted code* as used in BCD number systems. (4 marks)

(b) (i) Simplify the decimal number $1 - \frac{7}{8}$, giving your answer in binary notation. (3 marks)

(ii) Figure 2 represents a parallel circuit drawn by a student. Use it to answer the questions that follow.

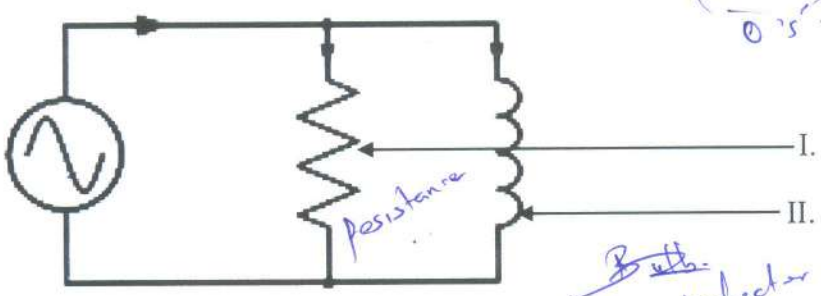


Figure 2

I. Identify the components labelled (I.) and (II.). (4 marks)

II. Explain the behaviour of voltage across the circuit. (1 mark)

13. (a) (i) List **six** types of diodes. (3 marks)

(ii) Differentiate *forward biasing* and *reverse biasing* of a p-n junction diode. (3 marks)

(b) (i) Outline **three** circumstances under which memory sticks could be used in computers. (3 marks)

(ii) A metal conductor has a length of 10 meter and resistivity of 5 ohms. Determine the:

I. cross-section area; (4 marks)

II. conductivity. (2 marks)

14. (a) (i) Outline **three** uses of the octal number system. (3 marks)

(ii) Determine the colour code of each of the following carbon composition resistors:

I. 13,000,000,000 ohms; (2 marks)

II. 97,000,000 ohms. (2 marks)

(b) (i) A student noted types of rheostats in a laboratory while doing an experiment. Outline **two** such types. (2 marks)

(ii) Draw the logical gate used for the Boolean expression.

$$Y = A\bar{B}C + A\bar{B}\bar{C} + \bar{A}BC + AB\bar{C}$$ (6 marks)

15. (a) (i) Explain **two** advantages of using BCD number systems. (4 marks)

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(ii) Figure 3 represent a logic circuit. Use it to answer the question that follows.

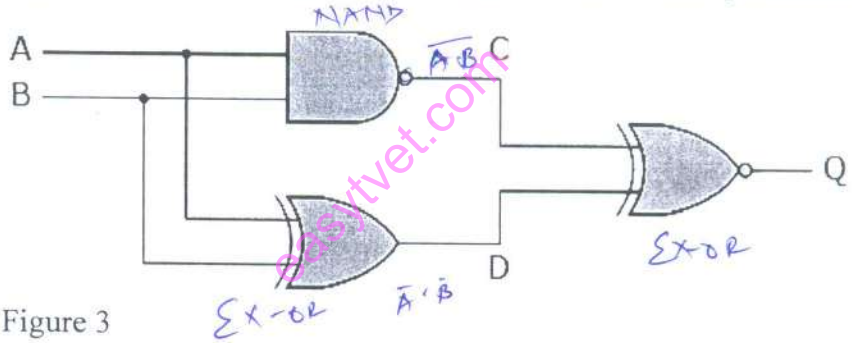

Figure 3

Draw a truth table for logic circuit. (5 marks)

(b) (i) Explain **two** circumstances that may necessitate the use of a Gray code in computers, other than in Karnaugh maps. (3 marks)

(ii) A circuit has a conductance of 4.2×10^{-2} Siemens and voltage of 10 volts. Determine the current in circuit. (3 marks)

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