1920/103
BASIC ELECTRONICS
November 2021
Time: 3 hours

THE KENYA NATIONAL EXAMINATIONS COUNCIL

CRAFT CERTIFICATE IN INFORMATION TECHNOLOGY

BASIC ELECTRONICS

3 hours

INSTRUCTIONS TO THE CANDIDATE

This paper consists of section A and B.

Answer ALL the questions section A and any FOUR from section B.

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.

Turn over

SECTION A (40 marks)

Answer ALL the questions in this section.

1. Define each of the following terms used in basic electronics:

   (i) magnitude; (1 mark)

   (ii) transformer; (1 mark)

   (iii) load; (1 mark)

   (iv) electron. — *The number of atoms in E other most energy level,* (1 mark)

2. Explain each of the followings terms as used in basic electronics:

   (i) error codes; (2 marks)

   (ii) NOT gate. (2 marks)

3. Determine the resistance of each of the following resistor's colour codes:

   (i) red, black, green, gold; (2 marks)

   (ii) purple, green, blue, silver. (2 marks)

4. Using one's complement, work out $11111000_2 - 10101111_2$. (4 marks)

5. Explain **two** characteristics of Read Only Memory (ROM). (4 marks)

6. Outline **four** disadvantages of semiconductor components. (4 marks)

7. Convert the following numbers to their gray code equivalent.

   (i) 71_8 (2 marks)

   (ii) $A3_{16}$ (2 marks)

8. Determine the octal equivalent for each of the following number systems.

   (i) 20.6_{16} (2 marks)

   (ii) 139_{10} (2 marks)

9. Explain each of the following terms as used in numbers systems:

   (i) logical shift; (2 marks)

   (ii) bitmask. (2 marks)

10. With the aid of a diagram, describe the n-type semiconductors. (4 marks)

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

11. (a) (i) Evaluate the following octal arithmetic.

64 x 13 (3 marks)

(ii) Differentiate between an *ohmmeter* and a *potentiometer*. (3 marks)

(b) (i) Explain **two** circumstances that could necessitate the use of a Zener diode in electronic components. (3 marks)

(ii) Figure 1 show an AC circuit assembled in the laboratory by a technician. Use it to answer the questions that follow.
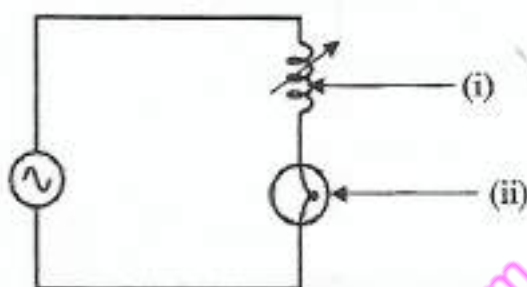

Figure 1

I. State the function of the parts labelled (i) and (ii) (2 marks)

II. Explain **two** applications of the part labelled (i) (4 marks)

12. (a) (i) Outline **three** challenges in the emerging trends of transistors. (3 marks)

(ii) Convert the following numbers systems into their hexadecimal equivalent.

I. 1761_8 (1 ½ marks)

II. 11010100_2 (1 ½ marks)

(b) (i) Draw of a DC circuit of one resistor in series and two resistors in parallel showing the flow of current. (4 marks)

(ii) Draw a truth table for the following Boolean expression.

$$Y = A\bar{B}CD + \bar{A}BCD + \bar{A}\bar{B}CD + A\bar{B}\bar{C}D$$ (5 marks)

13. (a) (i) List **four** types of resistors. (2 marks)

(ii) Explain **two** disadvantages of DRAM used in computers. (4 marks)

(b) (i) Draw the logical circuit for the following equation.

$$F = AB + CD + EF + GH$$ (5 marks)

(ii) Convert the following numbers into their decimal equivalent.

I. $F079_{16}$;   (2 marks)

II. 1011.11_2.   (2 marks)

14. (a) (i) Outline **three** disadvantages of using floppy disks.   (3 marks)

(ii) Figure 2 is a closed circuit with three capacitors C1 (40F), C2 (20F), C3 (10F) and voltage of 50V. Use it to answer the question that follows.
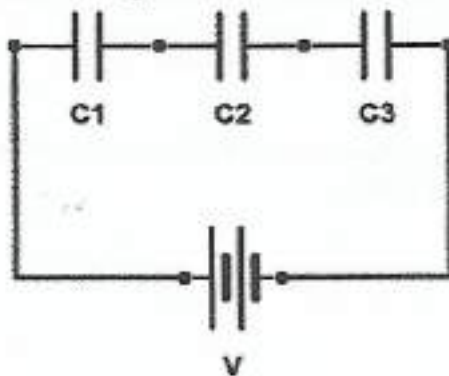

Figure 2

Determine voltage across each capacitor.   (4 marks)

b) (i) Students in a basic electronics class intend to discuss the factors that would affect the resistance of a wire conductor. Outline **three** such factors.   (3 marks)

(ii) Using BCD, evaluate.

I. $765_{10} - 331_{10}$ (2 marks)

II. $27_{10} + 98_{10}$ (3 marks)

15. (a) (i) List **six** types of DVD used in computers.   (3 marks)

(ii) Simplify the following Boolean algebra.

I. $(A+B)(A+C)$ (2 marks)

II. $AB + A(B+C) + B(B+C)$ (2 marks)

(b) (i) Differentiate between *reverse bias* and *forward bias* as used in semiconductor diodes.   (4 marks)

(ii) Explain **two** circumstances that would necessitate the use of NAND gates in circuits.   (4 marks)

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