1920/103
BASIC ELECTRONICS
July 2016
Time: 3 hours

THE KENYA NATIONAL EXAMINATIONS COUNCIL

CRAFT CERTIFICATE IN INFORMATION TECHNOLOGY

BASIC ELECTRONICS

3 hours

INSTRUCTIONS TO CANDIDATES

*This paper consists of **TWO** sections, A and B.*

*Answer **ALL** questions in **section A** and any **FOUR** in **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.

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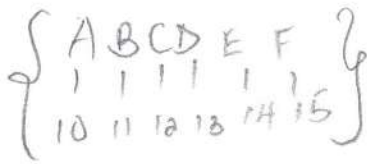
SECTION A (40 marks)

*Answer **ALL** the questions in this section.*

1. Define each of the following terms as used in international systems:

    (i)   inertia mass;   (2 marks)

    (ii) gravitational mass;   (2 marks)

2. With the aid of a sketch, outline a closed circuit that could be used to measure ohm's law in an experiment.   (4 marks)

3. Explain **two** applications of BCD in computers.   (4 marks)

4. Determine the octal equivalent for each of the following number systems:

    (i) $A C 2_{16}$ (2 marks)

    (ii) $1011 \; 1111_2$ (2 marks)

5. Calculate each of the following hexadecimal arithmetic:

    (i) $CBD + 484$ (2 marks)

    (ii) $E01 - 301$ (2 marks)

6. A conductor wire of length 24 m has a resistance of 16 Ω and conductivity of $3.2 \times 10 \; \Omega^{-1} \; m^{1}$. Determine the:

    (i)   resistivity of the wire in Ω;   (2 marks)

    (ii) cross-sectional area of the wire.   (2 marks)

7. Explain **two** methods used to encode a BCD number.   (4 marks)

8. Using 2's complement, evaluate $1001 \; 1001_2 - 1010 \; 1010_2$.   (4 marks)

9. The reverse-bias in a silicon p-n junction is significant to the evolution of computers. Explain **two** uses of this reverse-bias in computers.   (4 marks)

10. Draw a truth table for a NAND gate.   (4 marks)

SECTION B (60 marks)

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

11. (a) (i) Explain **two** disadvantages of CD-ROM. (4 marks)

(ii) Differentiate between *main memory* and *cache* as used in computers. (4 marks)

(b) (i) Determine the excess-3 equivalent of 1100 1111 1010 1001₂. (3 marks)

(ii) Determine the resistance of each of the following resistors

I. red, orange, blue, gold; (2 marks)

II. yellow, black, grey, silver; (2 marks)

12. (a) (i) Outline **three** ways in which direct current can be generated. (3 marks)

(ii) Explain **two** similarities of protons and neutrons of an atom. (4 marks)

(b) (i) Using BCD, determine 745 + 293, giving the answer in octal. (3 marks)

(ii) Table 1 shows represent a truth table for logic gates. Use the truth table to draw the logic gates used. (5 marks)

Input							Output
B	C	$B * C = R$	A	$A * \bar{R} = R$	D	$D * \bar{R} = S$	$\overline{R \oplus S} = Q$
0	0	1	0	0	0	0	1
0	1	1	0	0	0	0	1
1	0	1	1	0	1	1	0
1	1	0	1	0	1	0	1

Table 1

13. (a) (i) With the aid of a graph, describe the phase diagram showing current and voltage of a capacity and inductor involved in an AC circuit. (4 marks)

(ii) A circuit with a resistor of 80 Ω is connected to a voltage of 10 V. Determine the:

I. current (A) (2 marks)

II. power (watts). (3 marks)

Handwritten margin notes:
- Bad – Black – 0
- Boys – Brown – 1
- Raped – Red – 2
- Our – Orange – 3
- Young – Yellow – 4
- Girls – Green – 5
- But – Blue – 6
- Violet – Violet – 7
- Gave – Grey – 8
- Willingly – White – 9

(b) Simplify each of the following number operations giving your answer in hexadecimal equivalent:

(i) $2897_{10} + 1567_{10}$ (3 marks)

(ii) $7896_{10} - 6776_{10}$ (3 marks)

14. (a) (i)   List **four** types of ferromagnetic core inductors.   (2 marks)

(ii) Differentiate between *holes* and *electrons* in semiconductor materials.   (4 marks)

(b) (i)   Using laws of Boolean algebra, evaluate.

$$A B \overline{C} + A B C + \overline{A} \overline{B} C + \overline{A} \overline{B} \overline{C}$$ (5 marks)

(ii) Figure 1 shows a simple electric circuit with four resistors of resistance R_1 (16 Ω), R_2 (8 Ω), R_3 (2 Ω), and R_4 (6Ω) and voltage of 80 V. Determine the supply current I.   (4 marks)
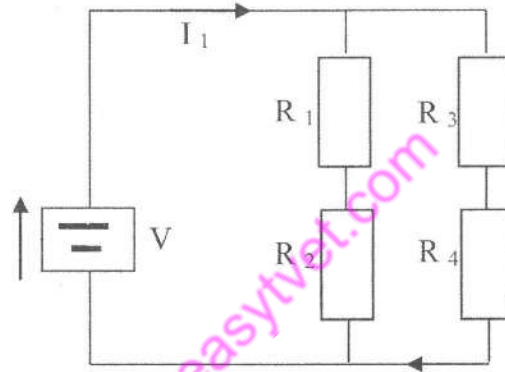

Figure 1

15. (a) (i)   Outline **three** physical characteristics of silicon material.   (3 marks)

(ii) Using the K-map, simplify the function $\sum m$ **(0, 12, 13, 14, 15)**.   (5 marks)

(b) (i)   All desktop computer use hard disks as their secondary storage media. Outline **three** advantages of this device.   (3 marks)

(ii) The fire detection alarm in a house is controlled by three air inlets; Q, R and S. The alarm goes off whenever windows Q, R and S are in the same positions. When R and S are in different positions, the alarm goes off, on condition that Q is high. Draw a truth table to represent the information.   (4 marks)

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