1920/103
BASIC ELECTRONICS
November 2016
Time: 3 hours

THE KENYA NATIONAL EXAMINATIONS COUNCIL

CRAFT CERTIFICATE IN INFORMATION TECHNOLOGY

BASIC ELECTRONICS

3 hours

INSTRUCTIONS TO CANDIDATES

You should have the following for this examination:
Answer booklet.
*Answer **ALL** questions in **section A** and any **FOUR** in **section B**.*
Candidates should answer the questions in English.

This paper consists of 5 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. Define each of the following terms as used in computers:

   (a) memory cell; (2 marks)

   (b) memory wall; (2 marks)

2. With the aid of a sketch, outline a closed circuit of three resistors in parallel (R_1, R_2, R_3) and a voltage supply of V_S. (4 marks)

3. Explain **two** limitations of BCD number systems. (4 marks)

4. Using 1's complement, evaluate $1000\ 1001_2 - 1010\ 1111_2$. (4 marks)

5. Determine the decimal equivalent for each of the following number systems:

   (a) $B\ C\ 8_{16}$; (2 marks)

   (b) $101\ 111_8$. (2 marks)

6. Explain each of the following terms as used in BCD number system:

   (a) most significant bit; (2 marks)

   (b) least significant bit. (2 marks)

7. A conductor wire of length 24 m has a resistance of 16 and conductivity of $3.2 \times 10\ \Omega^{-1}\ m^1$. The cross-sectional area of a conductor wire is 3.2×10^{-2}, resistivity of $4.0 \times 10^{-4}\ \Omega m$ and resistance of $8.0 \times 10^{-2}\ \Omega$. Determine the:

   (a) conductivity of the wire; (2 marks)

   (b) length of the wire in m. (2 marks)

8. Calculate each of the following binary arithmetic:

   (a) 1000 1110 + 1100 1111; (2 marks)

   (b) 1011 0001 – 1010 1000. (2 marks)

9. Draw a truth table for the logic gate in figure 1 (4 marks)

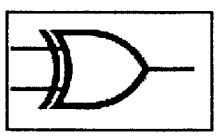

Figure 1

10. With the aid of a sketch, outline the PN junction diode showing the flow of current and depletion region formation. (4 marks)

SECTION B (60 marks)

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

11. (a) (i) Explain **two** advantages of DVD's over CD-ROM's. (4 marks)

(ii) Differentiate between *photo diode* and *light emitting diode*. (4 marks)

(b) (i) Determine the BCD equivalent of the following excess-3 code. (3 marks)

1100 1001 1010 1101.

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

I. brown, red, blue, no colour band; (2 marks)

II. green, violet, white, gold. (2 marks)

12. (a) (i) Figure 2 shows symbols used for voltage sources. Identify each symbol labelled (i), (ii), (iii), (iv), (v) and (vi). (3 marks)

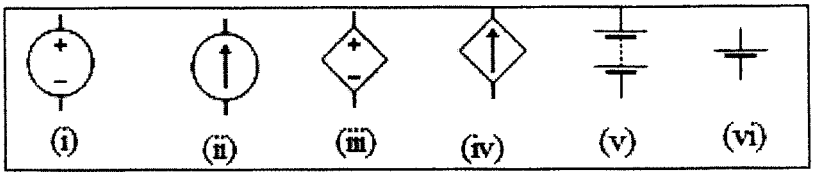

Figure 2

(ii) Explain **two** characteristics of a neutron of an atom. (4 marks)

(b) (i) Using BCD, determine 432 + 357, giving the answer in excess-3. (3 marks)

(ii) Represent the logic gates in figure 3 using a truth table. (5 marks)

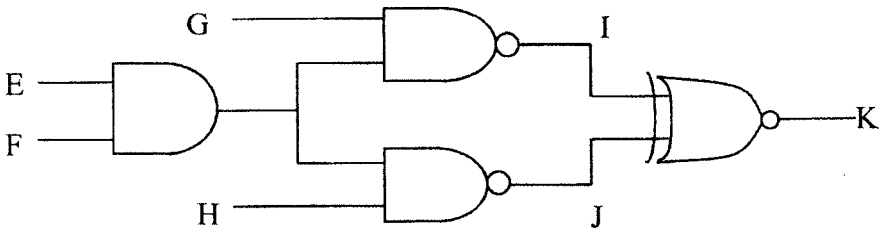

Figure 3

13. (a) (i) Figure 4 represents a Saw-tooth wave generated on a CRT-based computer screens. Outline the parts labelled (I), (II), (III) and (IV). (4 marks)

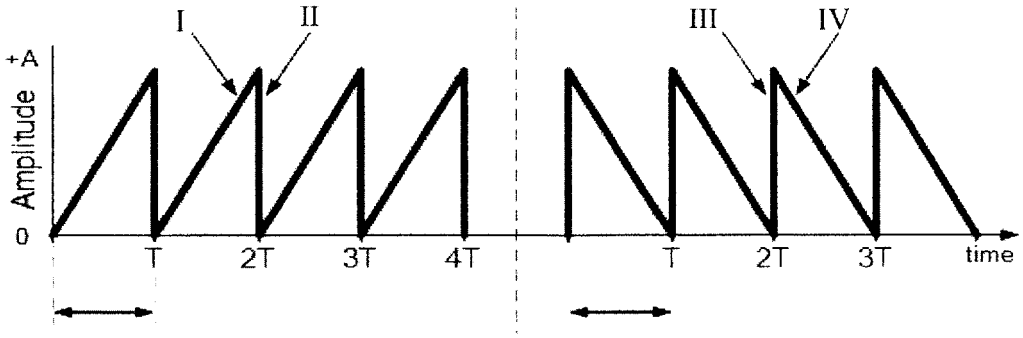

Figure 4

(ii) A circuit with a resistance of 40 Ω is connected to a voltage of 160 V. Determine the:

(I) current (A) (3 marks)

(II) conductance (G) (3 marks)

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

(i) $2234_8 + 1567_8$; (2 marks)

(ii) $2116_8 - 1717_8$. (3 marks)

14. (a) (i) List **four** types of capacitors. (2 marks)

(ii) Differentiate between *magnetic semiconductor* and *organic semiconductor* materials. (4 marks)

(b) (i) Using K-map, simplify the function. (5 marks)

$\sum m\ (3, 8, 12, 13, 15)$.

(ii) The curtains in a house is controlled by four light inlets W, X, Y and Z. The curtains are drawn up whenever W and X are in the different positions. When Y is low, the curtain is drawn up, on condition that Z is high. Draw a truth table to represent the information. (4 marks)

15. (a) (i) Outline **three** domestic DC installations. (3 marks)

(ii) Using the laws of Boolean algebra, evaluate. (5 marks)

$$A\bar{B}\bar{C}D + ABCD + A\overline{\overline{BCD}} + \overline{\overline{A}\overline{B}\overline{C}\overline{D}} + A\overline{\overline{B}\overline{C}D}$$

(b) (i) Explain **two** challenges that could be experienced while using flash memory. (3 marks)

(ii) With the aid of sketches in each case, outline the symbols of each of the following resistors:

(I) fixed resistor; (1 mark)

(II) variable resistor; (1 mark)

(III) rheostat; (1 mark)

(IV) potentiometer. (1 mark)

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