1920/103
BASIC ELECTRONICS
JULY 2019
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 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.

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SECTION A (40 marks)

Answer ALL the questions in this section.

1. Describe **two** types of voltage regulators. (4 marks)

2. Figure 1 shows an AC circuit, with three resistors $R_1 = 5\ \Omega$, $R_2 = 8\Omega$ and $R_3 = 7\Omega$ and a voltage of 40 V. Determine the current in the circuit. (4 marks)
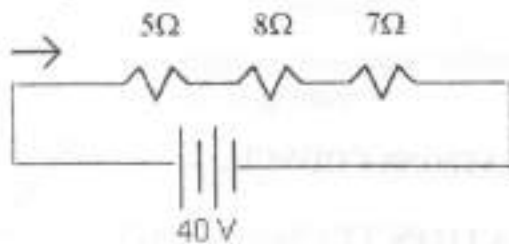

Figure 1

3. Convert the BCD number given to its Excess-3 equivalent: (4 marks)

    1001 0011 1000.

4. Differentiate between *carbon-zinc* batteries and *alkaline* batteries as used in D.C. circuits. (4 marks)

5. With the aid of a labelled sketch, outline the schematic symbol for a diode. (4 marks)

6. Explain **two** uses of extrinsic semiconductors. (4 marks)

7. Determine the binary equivalent of each of the following octal numbers:

    (i)   1 4 7; (2 marks)

    (ii) 6 0 1. (2 marks)

8. Explain **two** disadvantages of using removable computer storage media. (4 marks)

9. Sketch a NOR gate equivalent using two NOT gates and an OR gate. (4 marks)

10. Explain **two** circumstances of overflows during arithmetic operations of signed binary numbers. (4 marks)

SECTION B (60 marks)

Answer any FOUR questions from this section.

11. (a) (i) Outline **three** types of inductors. (3 marks)

    (ii) With the aid of sketches, outline one complete wave cycle for each of the following waves:

        I. sine; (1 mark)

        II. square; (1 mark)

        III. triangle. (1 mark)

(b) (i) Differentiate between *conduction band* and *indirect band gap* as used in semiconductors. (4 marks)

    (ii) A full adder is a three gate input (A, B, C_{in}) combination circuit with two outputs (Z, C_o). The first output records that value of the ORed three inputs and the second output records the carry from the ORed inputs. Draw a truth table that will represent the full adder. (5 marks)

12. (a) (i) Outline **three** behaviour of valence electrons. (3 marks)

    (ii) An electrician intends to determine the resistivity of a metal conductor. Explain **two** quantities that he would require. (4 marks)

(b) (i) Convert the following binary numbers to their gray code equivalent:

        I. 10111101; (2 marks)

        II. 10010001. (2 marks)

    (ii) Simplify the Boolean algebra using a K-map. (4 marks)

$$\overline{XYZ} + \overline{XY}Z + X\overline{YZ} + XY\overline{Z}$$

13. (a) (i) List **six** resistor colour codes used to determine the resistance. (3 marks)

    (ii) Juliet's computer uses an operating system that is installed on external hard disk. Explain **two** drawbacks of this type of memory. (4 marks)

(b) (i) Convert the following hexadecimal numbers to their decimal equivalent:

        I. A 8 E D; (2 marks)

        II. 9 F 0 7. (2 marks)

    (ii) Simplify the following Boolean expression. (4 marks)

$$ABC + AB\overline{C} + ABC + \overline{AB}C + ABC + \overline{A}BC$$

14. (a) (i) List **six** examples of Compact Disc (CDs) memory. (3 marks)

    (ii) Perform each of the following BCD arithmetic:

        I. 1001 1001 + 0110 1000; (2 marks)

        II. 1000 0110 - 0011 0001. (2 marks)

(b)   (i)   During revision, students were asked to provide definition of the following terms. Define each term:

       I.   joule;   (1 mark)

       II.   power;   (1 mark)

       III.   charge carrier;   (1 mark)

       IV.   nucleus.   (1 mark)

     (ii)   Explain **two** circumstances under which Integrated Circuits (IC's) could be used in computers.   (4 marks)

15.   (a)   (i)   Convert the following capacitance values as indicated:

       I.   24 nF to F;   (1 mark)

       II.   0.6 µF to F;   (1 mark)

       III.   770 pF to F.   (1 mark)

     (ii)   Using two's complement, evaluate 1110 1001 + 1011 1101   (4 marks)

   (b)   (i)   The computer memory continually transforms over time. Explain **two** challenges of coping with this trend.   (4 marks)

     (ii)   Determine the Excess-3 equivalent of the following decimal numbers:

       I.   31;   (2 marks)

       II.   24.   (2 marks)

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