

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.

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)

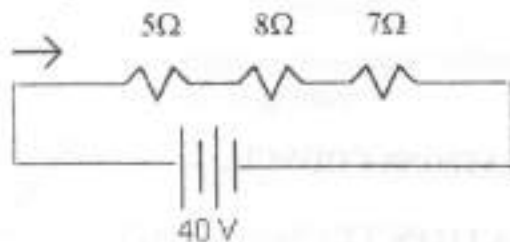


Figure 1

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) 147; (2 marks)
 - (ii) 601. (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)
- $$\overline{X}YZ + X\overline{Y}Z + XY\overline{Z} + XYZ$$
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)
- $$ABC + A\overline{B}C + A\overline{B}C + \overline{A}BC + ABC + \overline{A}BC$$
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 μ F 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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