

1920/103
BASIC ELECTRONICS
July 2017
Time: 3 hours



THE KENYA NATIONAL EXAMINATIONS COUNCIL
CRAFT CERTIFICATE IN INFORMATION TECHNOLOGY

BASIC ELECTRONICS

3 hours

INSTRUCTIONS TO CANDIDATES

*You should have an answer booklet for this examination:
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.

- Define each of the following terms as used in basic electronics:
 - electrode; (2 marks)
 - voltaic cell. (2 marks)
- With the aid of a sketch, outline a closed circuit of two capacitors in series (C_1 , C_2 and C_3) and a voltage supply V . (4 marks)
- Explain **two** methods used to encode BCD numbers. (4 marks)
- Using 2's complement, evaluate $1011\ 1111_2 - 1000\ 0001_2$. (4 marks)
- Determine the octal equivalent for each of the following number systems:
 - $E A\ 7_{16}$; (2 marks)
 - $1101\ 1011_2$. (2 marks)
- Explain each of the following terms as used in BCD:
 - floating point; (2 marks)
 - bit. (2 marks)
- Explain how the circuit in figure 1 satisfies the voltage law. (4 marks)

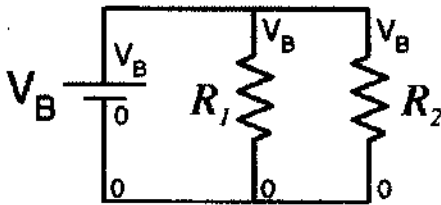


Figure 1

- Calculate each of the following hexadecimal arithmetic:
 - $A D C + 1 2 E$; (2 marks)
 - $2 4 C B - 1 1 1 E$. (2 marks)
- Table 1 represent a truth table for logic gate. Draw the logic gate and label it appropriately. (4 marks)

A	B
0	1
1	0

Table 1

10. A computer company intended to use the extrinsic semiconductor material to develop some components. Explain **two** possible applications of the material. (4 marks)

SECTION B (60 marks)

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

11. (a) (i) Explain **two** limitations of holographic storage. (4 marks)
 (ii) Differentiate between *volatile* and *non-volatile* computer memories. (4 marks)
- (b) (i) Determine the excess-3 equivalent of the BCD 1001 0110 1000 0000. (3 marks)
 (ii) Determine the colour codes for each of the following resistors resistance:
 (I) 75,000,000,005 ohms or 74,999,999,995 ohms; (2 marks)
 (II) 34,000,020 ohms or 34,999,980 ohms. (2 marks)
12. (a) (i) Figure 1 shows symbols used for voltage sources. Identify the components labelled I and II. (3 marks)

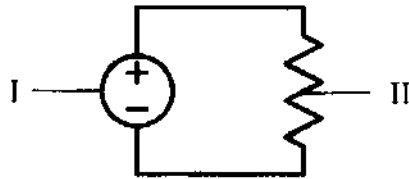


Figure 1

- (ii) Explain **two** properties that enable conduction of heat by electrons. (4 marks)
- (b) (i) Using BCD, determine $811 + 777$, giving the answer in hexadecimal. (3 marks)
 (ii) Using K-map, simplify the function. (5 marks)
 $\Sigma m (0, 1, 3, 9, 14, 15)$
13. (a) (i) With the aid of a sketch, outline the relationship between voltage, current applied to a resistor in an AC circuit. (4 marks)
 (ii) A circuit has a resistance of 60Ω and conductance (G) of 1.5×10^{-3} siemens. Determine the:
 (I) voltage (V) (3 marks)
 (II) current (I) (3 marks)
- (b) Simplify each of the following decimal number operations giving your answer in binary equivalent:
 (i) $74 + 89$; (2 marks)
 (ii) $1/8 + 1/2$. (3 marks)

14. (a) (i) Outline **two** patterns of current flow in a Zener diode. (2 marks)
- (ii) Differentiate between *doped semiconductor* and *undoped semiconductor* materials. (4 marks)
- (b) (i) Table 2 shows truth table. Use the truth table to draw the logic gates used. (5 marks)

Input					Output	
<i>B</i>	<i>C</i>	$B * C = \overline{M}$	<i>A</i>	<i>D</i>	$A * D = N$	$M + N = \overline{O}$
0	0	1	0	0	0	1
0	1	1	0	1	0	1
1	0	1	1	0	0	1
1	1	0	1	1	1	1

Table 2

- (ii) The lift mechanism in a building is controlled by four doors; A, B, C and D. The lift door is open whenever B and D are in the different positions. The lift door is open, on condition that A and C are high. Draw a truth table to represent the information. (4 marks)
15. (a) (i) Outline **three** techniques used for reducing radiation loss in AC circuits. (3 marks)
- (ii) A group of students intend to write a term paper about De Morgan's theorem applied in Boolean algebra. Outline **five** reduction techniques they are likely to include in the paper. (5 marks)
- (b) (i) DVD is one of the secondary memories used popularly to store movies. Explain **two** reasons for its popularity. (3 marks)
- (ii) The potentiometer is used in the development of some appliances. Outline **four** areas of application of this component. (4 marks)

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