Name_____ Index No._____/_____

1920/103
BASIC ELECTRONICS
November 2015
Time: 3 hours

Candidate's Signature _____

Date_____

THE KENYA NATIONAL EXAMINATIONS COUNCIL

CRAFT CERTIFICATE IN INFORMATION STUDIES

BASIC ELECTRONICS

3 hours

INSTRUCTIONS TO CANDIDATES

*Write your **name** and **index number** in the spaces provided above.*
Sign and write the date of examination in the spaces provided above.
*Answer **All** questions in section A and any **FOUR** in section B.*
Candidates should answer the questions in English.

For Examiner's Use Only

Section	Question	Maximum score	Candidate's score
A	1 - 10	40	
	11	15	
	12	15	
B	13	15	
	14	15	
	15	15	
		Total score	

This paper consists of 12 printed pages.

Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

Turn over

SECTION A (40 marks)

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

1. Outline **four** sources of energy that could be used in the society. (4 marks)

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2. With the aid of a sketch, outline variable capacitor symbols. (4 marks)

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3. Explain **two** disadvantages of *BCD* in comparison to *binary number system*. (4 marks)

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

    (i) $5\ 7\ 2_8$; (2 marks)

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    (ii) $10001\ 1111_2$. (2 marks)

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5. Calculate each of the following octal arithmetic:

   (i)   453 + 444;   (2 marks)

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   (ii)   765 - 301.   (2 marks)

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6. A conductor wire of length 24 m has a resistivity of 8×10^{-4} Ω m and cross sectional area of 1.6×10^{-2} m^2. Determine the:

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

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   (ii)   conductivity of the wire.   (2 marks)

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7. Explain **two** standard sign values for packed BCD used in computers.   (4 marks)

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8. Using one's complement, determine $1111\ 1001_2 - 1110\ 1000_2$. (4 marks)

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9. Bipolar transistors have distinct regions of operation. Outline **four** of these regions defined by junction biases. (4 marks)

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10. Draw a truth table for an exclusive OR (XOR) gate. (4 marks)

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SECTION B (60 marks)

*Answer any **FOUR** questions in this section in the spaces provided.*

11. (a) (i) Explain **two** disadvantages of *flash memory* as used in computers. (4 marks)

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(ii) Differentiate between *asynchronous* and *synchronous* as a character of Static RAM. (4 marks)

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(b) (i) Determine the BCD equivalent of $1100\ 1111\ 1010\ 1001_2$. (3 marks)

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(ii) A potential difference of 10 V is connected to a uniform resistance wire of length 0.4 m and cross sectional area of 16×10^{-8} m^2 with resistivity of 3.2×10^{-6} Ω m. Determine of the current flowing through the wire. (4 marks)

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12. (a) (i) Outline **three** components that should be included in a DC circuit. (3 marks)

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(ii) Explain **two** functions of the neutron in an atom. (4 marks)

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(b) (i) Using BCD, determine $342 + 213$, giving the answer in Excess-3 code. (3 marks)

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(ii)   Figure 1 shows an arrangement of logical gates. Construct a truth table showing
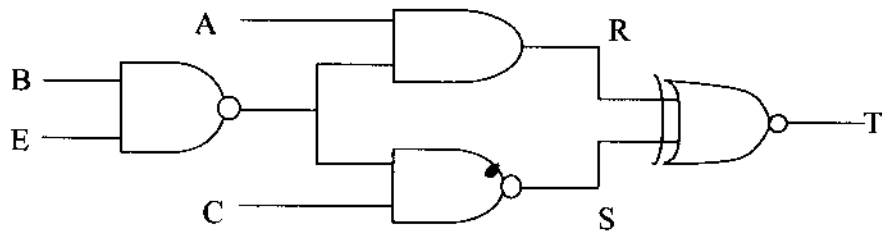   the outputs R, S and T.   (5 marks)

Figure 1

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13.   (a)   (i)   With the aid of sketches, outline **four** waveform shapes used in signals.
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(ii) A current of 80 A is connected to a voltage of 16 V. Determine the:

    I.   resistor R (Ω)   (2 marks)

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    II.   power in R in W (microwatts)   (3 marks)

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

    (i)   1001 0000+ 0100 1101;   (3 marks)

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    (ii)   1111 0100 -- 1100 0001.   (3 marks)

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14. (a) (i) State **four** applications of *diode* in the society, other than in logic gates. (2 marks)

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(ii) Differentiate between *N-type* and *P-type* semiconductor materials. (4 marks)

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

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

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(ii)   Figure 2 shows a simple electric circuit with four resistors of resistance R_1 (8 Ω), R_2 (6Ω), R_3 (4 Ω), and R_4 (8 Ω) and voltage of 80 V. Determine the supply current I_1.   (4 marks)

Figure 2

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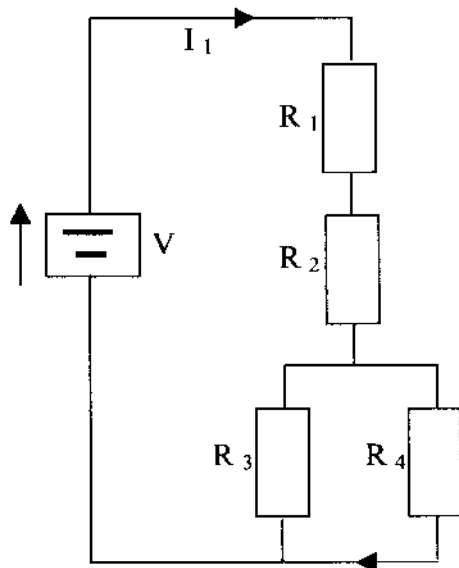
15.   (a)   (i)   Outline **three** uses of extrinsic semiconductors.   (3 marks)

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(ii)   Using the K-map, simplify the function $\sum m\ (0, 2, 8, 10)$.   (5 marks)

(b)   (i)   Improper management of memory is a common cause of bugs. Outline **three** such types of bugs.   (3 marks)

(ii)   Lights in a room are controlled by three windows M, N and O. The light enters whenever windows M, N and O are in different positions. When M and O are in same positions, light enters on condition that window N is high.

Draw a truth table to represent the information.   (4 marks)