higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

ELECTRONICS AND DIGITAL CONCEPTS FOR ROBOTICS

(First paper)

NQF LEVEL 2

(10041042)

16 November 2023 (Y-paper)
13:00–16:00

This question paper consists of 7 pages.

061Q1N2316

Copyright reserved

DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)
ELECTRONICS AND DIGITAL CONCEPTS FOR ROBOTICS
NQF LEVEL 2
PAPER 1
TIME: 3 HOURS
MARKS: 100

INSTRUCTIONS AND INFORMATION

1. Answer all the questions.
2. Read all the questions carefully.
3. Number the answers according to the numbering system used in this question paper.
4. Use only a black or blue pen.
5. Start each section on a new page.
6. Write neatly and legibly.

Copyright reserved

SECTION A

QUESTION 1

Various options are given as possible answers to the following questions. Choose the answer and write only the letter (A–D) next to the question number (1.1–1.10) in the ANSWER BOOK.

1.1 Which notation is easier to write, very large or very small numbers?

A Decimal
B Scientific
C Common prefixes
D Plain

1.2 A nucleus in which the protons and neutrons are present.

A Atom structure
B Atomic mass
C Ionic bond
D Covalent bond

1.3 The current flow in a closed circuit is directly proportional to the applied voltage in the circuit and inversely proportional to the resistance.

A Ohm's law
B Joule's law
C Resistance
D Energy

1.4 Which ONE electric currents changes its direction at regular intervals?

A Alternating current
B Direct current
C Power
D Magnetic fields

1.5 Identify examples of primary cells

A Leclanche cell
B Zinc-chloride cell
C Mercury cell
D All of the above-mentioned

1.6 Which ONE electronic component stores and releases electricity in a circuit?

A Capacitor
B Inductor
C Resistor
D Transistors

Copyright reserved

1.7 … resistors are made from an aluminium or ceramic substance with electrode bases on either side.

A Wire-wound
B Carbon
C Metal film
D SMD

1.8 A two-terminal semiconductor device that is used for allowing electric current in one direction is a/an...

A N-type semiconductor
B P-type semiconductor
C PN junction diode
D Anode

1.9 Which ONE diode can act as a voltage regulator by providing a constant voltage?

A LED
B PN Diode
C Zener diode
D Transistor

1.10 Identify ONE example of a temperature sensor below:

A Photoresistor
B Photodiodes
C Passive Infrared sensor
D Mercury Thermometer

(10 × 1) **[10]**

QUESTION 2

Indicate whether the following statements are TRUE or FALSE by writing only 'True' or 'False' next to the question number (2.1–2.5) in the ANSWER BOOK.

2.1 In a series circuit, the current splits up so that the current can flow in more than one branch.

2.2 A soldering iron is a piece of equipment used to join components, wires, and conductors.

2.3 A Breadboard is a platform with internal connections on which a prototype of a circuit can be built.

2.4 A solid angle is the space between two straight lines intersecting at a point.

2.5 In South Africa, OHSA is a document with guidelines to assist employers and employees in following safety procedures at work.

(5 × 1) **[5]**

Copyright reserved

QUESTION 3

Choose a term from COLUMN B that matches a description in COLUMN A. Write only the letter (A–L) next to the question number (3.1–3.10) in the ANSWER BOOK.

COLUMN A		COLUMN B	
3.1	Colour uses in aisle ways, traffic lanes and work cells	A	red
3.2	Desoldering pump	B	Watters
3.3	Logic gates that have only one input	C	yellow
3.4	An example of digital electronic circuits	D	intrinsic semiconductor
3.5	Measuring the average of the power consumed by a circuit	E	parallax error
3.6	Used to remove and insert wires and components on Breadboards and Veroboards	F	CMOS
3.7	Inaccurate readings	G	saturation
3.8	Pure semiconductor	H	metallic bonding
3.9	A transistor fully switched on.	I	solder sucker.
3.10	Electrons can be shared with all atoms in a material	J	long-nose pliers
		K	NOT
		L	AND

(10 × 1) **[10]**

QUESTION 4

Complete the following sentences by writing only the missing word or words next to the question number (4.1–4.5) in the ANSWER BOOK.

4.1 … is a measure of the force that can cause an object to rotate about an axis.

4.2 A material that does not easily conduct electric current is called …

4.3 Transistors are also used as switches in … circuits to generate a frequency.

4.4 A/an … is an amplifier with two inputs and one output.

4.5 A/an … is a device that measures alternating or direct electric current.

(5 × 1) **[5]**

TOTAL SECTION A: 30

SECTION B

QUESTION 5

5.1 Convert the following decimal notation into scientific notation:

5.1.1 1100 000

5.1.2 256 000

5.1.3 75600

(3 × 1) (3)

5.2 Determine the speed of the vehicle when it covers a 240 km distance in a time of 3 hours. (3)

5.3 Calculate the arc length at an angle of 30˚ in a circle with a radius of 50cm. (5)

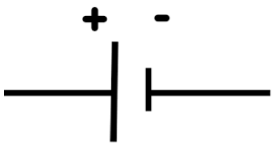
5.4 Illustrate the periodic table element carbon. (4)

[15]

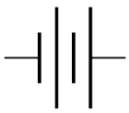
QUESTION 6

6.1 Identify the following circuit symbols by labelling them next to the question number (6.1.1–6.1.5) in the ANSWER BOOK.

6.1.1



6.1.2



6.1.3



6.1.4



6.1.5



(5 × 1) (5)

6.2 Illustrate the PN junction diode diagram. (8)

[13]

QUESTION 7

7.1 Define the following:

7.1.1 *SI Unit*

7.1.2 *Luminous intensity*

7.1.3 *Magnetic field*

7.1.4 *Ionic bond*

7.1.5 *Boolean logic*

(5 × 1) (5)

7.2 Distinguish between *transducers* and *sensors*. (2 × 2) (4)

7.3 Briefly discuss how to use a Breadboard. (5 × 1) (5)

[14]

QUESTION 8

8.1 Mention any FIVE electrical measuring and testing instruments. (5)

8.2 Draw the following:

8.2.1 AND gate circuit using switches. (5)

8.2.2 OR gate IEC symbol (3)

[13]

QUESTION 9

9.1 A battery consists of six cells, each with an EMF of 2,1 V and an internal resistance of 0.4 Ω.
Calculate the following:

9.1.1 The total EMF of the battery

9.1.2 The total internal resistance of the battery

(3 × 2) (6)

9.2 Identify FOUR types of safety signs. (4)

9.3 Mention FIVE safety precautions when desoldering. (5)

[15]

TOTAL SECTION B: 70
GRAND TOTAL: 100

Copyright reserved