higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

ELECTRONICS AND DIGITAL CONCEPTS FOR ROBOTICS

NQF LEVEL 2

(First paper)

(10041042)

18 February 2025 (Y-paper)
13:00–16:00

This question paper consists of 8 pages.

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DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)
ELECTRONICS AND DIGITAL CONCEPTS FOR ROBOTICS
NQF LEVEL 2
(First paper)
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. Write neatly and legibly.

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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 type of signal is continuous with an amplitude that changes with time?

A Digital
B Analogue
C Frequency
D Synchronisation

1.2 A/An … is the centre of an atom, consisting of protons and neutrons.

A element
B atomic mass
C nucleus
D electron

1.3 … is the distance an object moves in a certain direction.

A Velocity
B Speed
C Displacement
D Time

1.4 Which law states that the current through a conductor between two points is directly proportional to the voltage across the two points, provided that all physical conditions and temperature remain the same?

A Joule's law
B Kirchhoff's voltage law
C Ohm's law
D Magnetic fields

1.5 Which type of cell converts sunlight directly into electricity?

A Dry cell
B Zinc-chloride cell
C Fuel cell
D Solar cell

1.6 Which electronic component transfers energy from one AC circuit to another by either stepping up or stepping down voltage?

A Transformer
B Inductor
C Relay
D Fuse

1.7 Which type of capacitor consists of stationary plates and moveable plates?

A Ceramic
B Air
C Electrolytic
D Mica

1.8 A two-terminal semiconductor device that allows electric current in one direction:

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

1.9 Which type of circuit is continuous with current flowing through it?

A Closed circuit
B Series circuit
C Open circuit
D Short circuit

1.10 An example of a light sensor:

A Thermocouple
B Passive infrared
C Transmitter
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 Luminous intensity measures the quantity of visible light emitted in unit time per unit solid angle.

2.2 Valence electrons specify the number protons in the nucleus.

2.3 Veroboard is a type of strip board used for more permanent prototyping.

2.4 A truth table is an algebraic statement that represents a logic circuit in Boolean logic.

2.5 Electrostatic discharge is a quick, short flow of current between two points where there is normally not an electrical or physical connection.

(5 × 1) **[5]**

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QUESTION 3

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

COLUMN A		COLUMN B	
3.1	Logic multiplication represented by dots	A	PCB
3.2	Colour code for warning/caution	B	buzzer
3.3	Master timing signal	C	FET
3.4	Current-controlled transistor	D	probes
3.5	Component that creates an audible tone when voltage is applied	E	hazard
		F	clock pulse
3.6	Type of resistor consisting of three terminals	G	red
3.7	Acts as a voltage regulator	H	yellow
3.8	Connecting rods	I	potentiometer
3.9	Source of danger	J	BJT
3.10	Fibreglass board with copper	K	photodiode
		L	Zener diode
		M	AND

(10 × 1) **[10]**

QUESTION 4

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

In an intrinsic semiconductor, the number of (4.1) … and number of P-type charge carriers are (4.2) … If a pure semiconductor is doped with a donor (4.3) …, the (4.4) … charge carriers will be electrons and the (4.5) … carriers will be whole.

(5 × 1) **[5]**

TOTAL SECTION A: 30

SECTION B

QUESTION 5

5.1 Convert each of the following decimal notations into scientific notation:

5.1.1 130 000

5.1.2 256 000

5.1.3 1 080 000 000

(3 × 1) (3)

5.2 An athlete runs 80 m in 30 s and then increases her speed to 12 km/h and runs for another 30 s.

Determine her acceleration. (10)

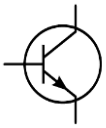
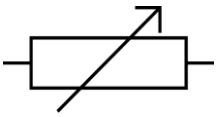
5.3 How much current will flow through a circuit with a resistance of 220 kΩ when a voltage of 12 V is applied? (3)

5.4 Illustrate the periodic table element carbon. (4)

[20]

QUESTION 6

6.1 Identify each of the following components or component symbols:

COMPONENT	COMPONENT SYMBOL
6.1.1	
Diode	**6.1.2**
6.1.3	
Switch	**6.1.4**
6.1.5	

(5 × 1) (5)

6.2 Give FIVE advantages of an integrated circuit. (5)

6.3 Distinguish between a *transducer* and a *sensor*. (2 + 2) (4)

[14]

QUESTION 7

7.1 Define each of the following concepts:

7.1.1 Thermocouple

7.1.2 Open circuit

7.1.3 Density

7.1.4 Energy

7.1.5 Logic gate

(5 × 1) (5)

7.2 Briefly discuss FIVE basic soldering guidelines. (5 × 2) (10)

7.3 Write the abbreviation PPE in full. (1)

[16]

QUESTION 8

8.1 List SIX tools used in an electronic workshop. (6)

8.2 Draw a NOT gate ANSI symbol. (2)

8.3 Write down the associative law for AND and OR gates. (2)

[10]

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QUESTION 9

9.1 List FIVE safety precautions for electrostatic discharge. (5)

9.2 Identify each of the following safety signs:

9.2.1



9.2.2



9.2.3



9.2.4



9.2.5



(5 × 1) (5)
[10]

TOTAL SECTION B: 70
GRAND TOTAL: 100

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