higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

## NATIONAL CERTIFICATE (VOCATIONAL)

# ELECTRONIC CONTROL AND DIGITAL ELECTRONICS
## NQF LEVEL 2

(12041022)

**12 November 2024 (Y-paper)**
**13:00–16:00**

**Calculators may be used.**

**This question paper consists of 6 pages.**

057Q1N2412

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# DEPARTMENT OF HIGHER EDUCATION AND TRAINING
# REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)
ELECTRONIC CONTROL AND DIGITAL ELECTRONICS
NQF LEVEL 2
TIME: 3 HOURS
MARKS: 100

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**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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## QUESTION 1

1.1 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 (1.1.1–1.1.5) in the ANSWER BOOK.

1.1.1 An electronic component that is used to store an electrical charge.

A Inductor
B Resistor
C Capacitor
D Transformer

1.1.2 The value of a 1W8R2M resistor.

A 47 000 Ω 20%
B 8,2 Ω 20%
C 2,2 kΩ 20%
D 683 kΩ 20%

1.1.3 A device that is used to step up or step down the voltage of a circuit, so that it can be used at another voltage value.

A Capacitor
B Inductor
C Transformer
D Resistor

1.1.4 What is the value of a capacitor with the following colours: yellow, violet, orange, red and green?

A 33 pF 5% 400 V
B 47 nF 2% 500 V
C 470 pF 10% 100 V
D 4,7 pF 2% 500 V

1.1.5 A four-band colour coded resistor has the following colours: yellow, violet, yellow and gold. What is the value of the resistor?

A 470 kΩ 5 %
B 470 Ω 5%
C 470 MΩ 5%
D 480 kΩ5%

(5 × 2) (10)

1.2 Choose a statement from COLUMN B that matches a word in COLUMN A. Write only the letter (A–F) next to the question number (1.2.1–1.2.5) in the ANSWER BOOK.

| COLUMN A | | COLUMN B | |
|---|---|---|---|
| 1.2.1 | Relay | A | an atom that has lost or gained one or more electrons |
| 1.2.2 | Transformer | B | oppose changes in current flow and store electrical energy in the form of a magnetic field |
| 1.2.3 | Potentiometers | C | electrons orbiting in the outermost shell |
| 1.2.4 | Valence electrons | D | an electrically operated switch used to effect changes in an independent circuit |
| 1.2.5 | Ionize atoms | E | a device that transfers electrical energy from one circuit to another by electromagnetic induction |
| | | F | a three-terminal device which is used for controlling the level of voltage |

(5 × 1) (5)

1.3 List FIVE features to consider when choosing a relay. (5)
**[20]**

**QUESTION 2**

2.1 Draw a neat, labelled diagram of P-type material. (4)

2.2 Explain the following terms used in atomic theory:

2.2.1 Conductors

2.2.2 Insulators

(2 × 1) (2)

2.3 List TWO types of diodes and give the application of each. (4)

2.4 Explain how a PNP transistor works. (5)

2.5 State TWO advantages of operational amplifiers. (2)

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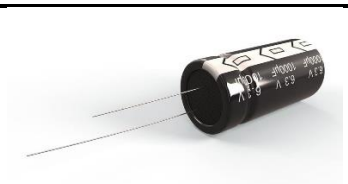
2.6 Name the components shown in the images below:

2.6.1



2.6.2



(2 × 1) (2)

2.7 Explain how one would use a multi meter to test a diode. (6)
**[25]**

**QUESTION 3**

3.1 Differentiate between *analogue signals* and *digital signals*. (2)

3.2 Explain how voltage levels are interpreted in a digital circuit for TTL logic gates. (6)

3.3 Convert the binary number, $10111_2$, to a decimal number. (3)

3.4 Use 2's complement to subtract $1101_2$ from $1011_2$. (5)

3.5 Draw a truth table to explain the operation of a NOR gate. (4)

3.6 Draw the IEC symbol for the following gates:

3.6.1 NOT gat6e

3.6.2 Exclusive OR gate

3.6.3 NAND gate

(3 × 1) (3)

3.7 Construct a neat labelled circuit diagram of a clocked JK flip-flop using NAND gates. (10)

3.8 Name TWO types of flip-flops. (2)
**[35]**

**QUESTION 4**

4.1 Name FOUR types of ports used in a computer tower. (4)

4.2 State FOUR components or attachments of a typical personal computer. (4)

4.3 List TWO types of secondary memory. (2)

**[10]**

**QUESTION 5**

Explain how a thermometer works. **[10]**

**TOTAL: 100**

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