higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

ELECTRONIC CONTROL AND DIGITAL ELECTRONICS
NQF LEVEL 2

(12041022)

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

Calculators may be used.

This question paper consists of 5 pages.

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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

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. Start each question on a new page.
5. Round off answers to TWO decimal places.
6. Use only a black or blue pen.
7. Write neatly and legibly.

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QUESTION 1

1.1 Indicate whether the following statements are TRUE or FALSE by writing only 'True' or 'False' next to the question number (1.1.1–1.1.10) in the ANSWER BOOK.

1.1.1 An atom is the smallest particle that a compound can be reduced to before it breaks down into its elements.

1.1.2 The mass number is the total number of protons and neutrons in an atom.

1.1.3 Valence electrons are electrons orbiting in the outermost shell.

1.1.4 Conductors are materials that block the flow of electric current.

1.1.5 A covalent bond is the mutual sharing of electrons between atoms.

1.1.6 N-type material is semiconductor material obtained by adding a pentavalent impurity atom.

1.1.7 In a P-type semiconductor the number of electrons is larger than the number of holes.

1.1.8 An extrinsic semiconductor is a pure semiconductor.

1.1.9 Donor doping is the process of generating free electrons.

1.1.10 An ionised atom has lost or gained one or more free electrons.

(10 × 1) (10)

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

COLUMN A		COLUMN B	
1.2.1	Two-terminal component that resists or opposes an electric current	A	capacitor
1.2.2	Electronic component that can store energy in a magnetic field created by the electric current passing through it	B	transformer
1.2.3	Electrically powered switch	C	resistor
1.2.4	Electronic component used to store an electrical charge	D	relay
1.2.5	Device that transfers electrical energy from one circuit to another	E	inductor

(5 × 1) (5)

1.3 What is the capacitance value of a capacitor with the following colours?

Yellow, green, yellow, white and red (4)

1.4 Draw a fully labelled circuit diagram of a half-wave rectifier that has a filter capacitor and a load resistor. (5)

1.5 Define a *transistor*. (1)

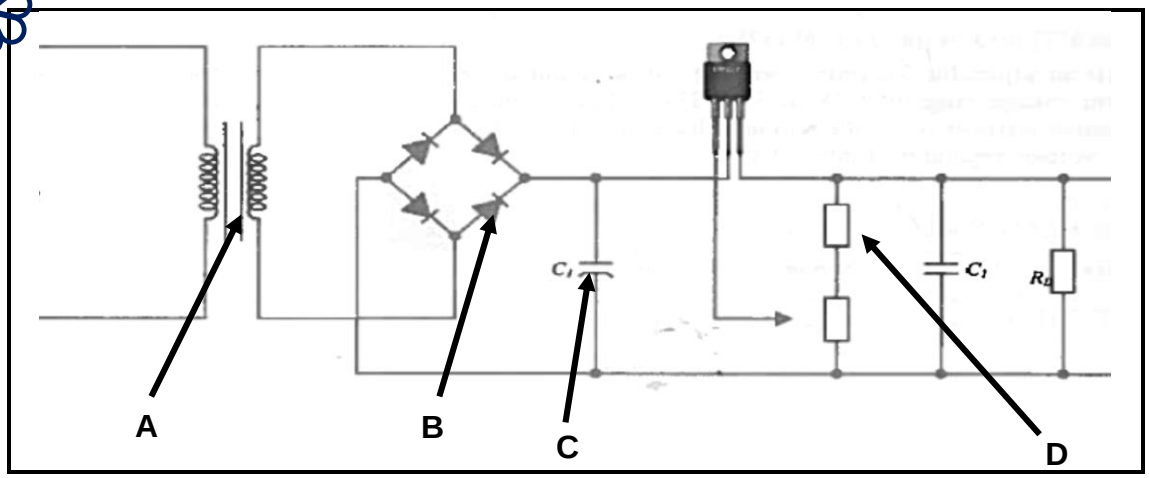
[25]

QUESTION 2

2.1 Name TWO types of linear or analogue integrated circuits. (2)

2.2 Give TWO applications of op-amps. (2)

2.3



Name the components by writing only the answer next to the letter (A–D) in the ANSWER BOOK. (4 × 1) (4)

2.4 Explain how to test a NPN transistor with a digital multimeter. (6)

2.5 Give ONE use of each of the following:

2.5.1 Desoldering pump

2.5.2 Side cutter

2.5.3 Cable knife

(3 × 1) (3)

2.6 Calculate the capacitance of two capacitors, 22 µF and 33 µF respectively, that are connected in series. (3)

[20]

QUESTION 3

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

3.2 Explain how voltage levels are used to represent bits. (2)

3.3 Convert 342_{10} to a binary number. (3)

3.4 Add 110_2 to 101. (2)

3.5 Subtract 11010_2 from 1001_2 by using one's complement. (4)

3.6 Define the term *even parity bit*. (2)

3.7 Draw an AND gate switching circuit and explain its operation. (8)

3.8 Draw the IEC symbol for each of the following gates:

3.8.1 NOR gate

3.8.2 NAND gate

3.8.3 XOR gate

(3 × 1) (3)

3.9 Name FOUR types of flip-flops. (4)

3.10 Make a construction drawing of an SR flip-flop using NOR gates. (5)

[35]

QUESTION 4

4.1 Name the THREE main types of software used in a PC system. (3)

4.2 Name THREE components of a computer. (3)

4.3 Differentiate between *volatile memory* and *non-volatile memory* and give ONE example of each. (2 + 2) (4)

[10]

QUESTION 5

5.1 Make a construction drawing of a sight glass for measuring level. (5)

5.2 Explain the operation of a bimetal strip. (4)

5.3 Give ONE advantage of a venturi tube. (1)

[10]

TOTAL: 100

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