higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

ELECTRONIC CONTROL AND DIGITAL ELECTRONICS
NQF LEVEL 2

(12041022)

07 November 2022 (Y-paper)
13:00–16:00

Calculators may be used.

This question paper consists of 5 pages.

079Q1N2207

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

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QUESTION 1

1.1 Indicate whether the following statements are TRUE or FALSE. Choose the answer and write only 'True' or 'False' next to the question number (1.1.1–1.1.5) in the ANSWER BOOK.

1.1.1 An atomic number is the number of electrons in a nucleus.

1.1.2 Conductors are elements with more than four electrons.

1.1.3 Ionisation involves the losing and gaining of electrons.

1.1.4 A covalent bond is the sharing of electrons between atoms to complete the valence shell.

1.1.5 Electron flow is the movement of electrons from the negative terminal to the positive terminal.

(5 × 1) (5)

1.2 Draw a labelled sketch of a silicon atom with 14 electrons. (4)

1.3 Name and explain TWO types of bonding processes. (4)

1.4 What is the colour coding of a 470 kΩ resistor? (2)

1.5 Explain TWO limitations in the operating conditions of PN junctions. (4)

1.6 Define a *BJT*. (1)

[20]

QUESTION 2

2.1 List FOUR disadvantages of integrated circuits. (4)

2.2 Name THREE applications of op-amp. (3)

2.3 Sketch the following electronic symbols.

2.3.1 Electrolytic capacitor

2.3.2 Diode

2.3.3 Step-down transformer

2.3.4 Resistor

2.3.5 Light-emitting diode

(5 × 1) (5)

2.4 Describe how you would test a transistor with a digital multimeter. (4)

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2.5 With the aid of the diagram, explain how you would connect the following instruments in a circuit:

2.2.1 Ammeter

2.2.2 Voltmeter

2.2.3 Ohmmeter

(3 × 2) (6)

2.6 Calculate the inductance of two inductors, L_1 = 30 mH and L_2 = 50 mH, connected in series. (3)

[25]

QUESTION 3

3.1 State FOUR advantages of a digital system compared to an analogue system. (4)

3.2 Define a *positive logic*. (2)

3.3 Convert 11101_2 to a binary number. (3)

3.4 Convert 568_{10} to a binary number. (3)

3.5 Calculate the value of the following binary numbers:

3.5.1 $1111_2 + 110_2$

3.5.2 $1101_2 – 1001_2$

(2 × 2) (4)

3.6 Use 1’s complement to subtract 1011_2 from 1001_2. (5)

3.7 Define *odd-parity bit*. (2)

3.8 Draw a fully labelled switching circuit of OR gates. (4)

3.9 Draw a circuit diagram of an RS flip-flop using NAND gates. (5)

3.10 Sketch the IEC symbol for a D-type flip-flop. (3)

[35]

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QUESTION 4

4.1 Define *hardware*. (1)

4.2 Explain the use of the following computer ports:

4.2.1 Serial port

4.2.2 Parallel port

(2 × 1) (2)

4.3 Briefly describe how a digital versatile disk (DVD) is used to store information. (7)

[10]

QUESTION 5

5.1 Name THREE types of probes used in liquid levels. (3)

5.2 List TWO types of thermistors. (2)

5.3 Explain the operation of photovoltaic cells. (5 × 1) (5)

[10]

TOTAL 100

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