higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

ELECTRONICS
NQF LEVEL 2

(10041012)

10 December 2020 (X-paper)
09:00–12:00

This question paper consists of 8 pages

489Q1N2010

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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. Start each section on a new page.
5. Use only a black or blue pen.
6. Write neatly and legibly.

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QUESTION 1

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

1.1 There are six sources of external energy that are capable of freeing electrons. They are …

A friction, magnetism, chemical action, heat, pressure and light
B friction, rectification, chemical action, heat, pressure and light
C multiplexing, rectification, chemical reaction, pressure and light
D All of the above

1.2 A … is an electrical device that allows current to flow in one direction and it emits light when current flows through it.

A varactor diode
B light-dependent diode
C photo diode
D Zener diode

1.3 If a person has experienced electric shock, their skin is …

A pale and bluish, and feeling cold, clammy and sweaty.
B reddish and feeling warm, clammy and sweaty.
C pale and bluish, and feeling cold and shrinking.
D None of the above

1.4 … states that current is directly proportional to voltage and inversely proportional to resistance

A Lenz's law
B Kirchoff's current law
C Faraday's law
D None of the above

1.5 Lesego realises that he has soldered a wrong component onto a Veroboard.

Which tools should Lesego use to remove the component?

A Wire stripper, side cutter, soldering wire and soldering wick
B Desoldering sucker, soldering iron and long-nose pliers
C Screw driver, side cutter, soldering iron and helping hands
D Helping hands, desoldering sucker, long-nose pliers and soldering iron

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1.6 Tshepo wants to check if all the components are connected correctly according to circuit layout.

At what scale should he set the multimeter to check if the components are connected correctly?

A Continuity mode
B Diode mode
C AC mode
D DC mode

1.7 The output of a … is logic one only if one input is logic one; otherwise, the output is logic zero.

A NOT gate
B NOR gate
C NAND gate
D None of the above

1.8 The mathematical operation X = A+B can be executed by a/an …

A NOR gate
B OR gate
C AND gate
D NAND gate

1.9 A … is used to enter input instructions into a PLC.

A monitor
B mouse
C programming device
D None of the above

1.10 The difference between the highest and the lowest frequency is called …

A wavelength.
B attenuation.
C bandwidth.
D modulation.

(10 × 1) **[10]**

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QUESTION 2

2.1 Explain how electricity is produced if conducting material is exposed to light. (2)

2.2 Name TWO characteristics of magnetic lines of flux. (2)

2.3 What will happen according to Ohm's law to the current flowing through a resistor if the resistance of the circuit is increased? (1)

2.4 Draw circuit symbols for the following electrical devices:

2.4.1 Variable resistor

2.4.2 PN junction diode

2.4.3 Capacitor

2.4.4 Zener diode

2.4.5 Inductor

(5 × 1) (5)

2.5 Read the scenario below and answer the questions.

Two resistors of 10 kΩ and 20 kΩ respectively are connected in parallel, and this combination is connected in series with 25 kΩ. The circuit is connected across a 100 V supply.

2.5.1 Draw the circuit diagram of the circuit. (3)

2.5.2 Calculate the total resistance of the circuit. (3)

2.5.3 Calculate the total current through the circuit. (2)

2.5.4 Determine the colour code of 20 kΩ assuming the tolerance is 20%. (4)

2.5.5 Determine the power dissipated through the circuit. (2)

2.6 *Rectification* is the process of converting an AC signal to a DC signal.

Draw an output waveform of a full-wave rectifier (1)

[25]

QUESTION 3

3.1 Name THREE causes of electrical shock. (3)

3.2 Explain what is meant by a *restricted area*. (1)

3.3 What is an isolator switch? (1)

3.4 What safety measures and procedures should be put in place in a workplace to ensure that employees are not in danger of being exposed to electrical shock? (5)

[10]

QUESTION 4

4.1 Name TWO electrical quantities other than voltage that can be measured using a multimeter. (2)

4.2 Study FIGURE 1 below and answer the question.

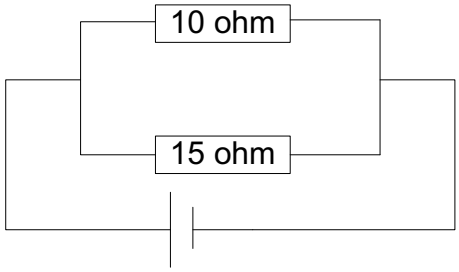

FIGURE 1 (4)

Redraw the circuit in your ANSWER BOOK.
Show how to measure current through the 15-ohm resistor by connecting the ammeter to the circuit.
Show how to measure voltage across the 10-ohm resistor by connecting the voltmeter to the circuit.

4.3 At what scale should the multimeter be set to measure the value of an unknown current? (1)

4.4 Will the current through the 10-ohm resistor in QUESTION 4.2 increase, decrease or stay the same if another resistance of 20 ohm is connected in parallel across the 15-ohm resistor? (1)

4.5 What scale should be set on a multimeter to ensure that there is connection between the two resistors in QUESTION 4.2? (2)

[10]

QUESTION 5

5.1 Why is it important to dispose of waste material? (2)

5.2 What causes the colour of soldered joints to be dull? (1)

5.3 What is a wet sponge used for during soldering? (1)

5.4 How do you identify the positive lead of a LED using a multimeter? (3)

5.5 You have soldered all the components on your PCB and connected the power supply but the circuit is not working.

Name THREE checks that you can use to identify the fault. (3)
[10]

QUESTION 6

6.1 6.1.1 Convert 23_{10} to binary.

6.1.2 Convert 17_{10} to binary.

(2 × 2) (4)

6.2 Use your answers in QUESTION 6.1 to calculate the following and leave the final answers in binary:

6.2.1 23_{10} - 17_{10}

6.2.2 23_{10} + 17_{10}

(2 × 2) (4)

6.3 Study the following statement and answer the question.

The output is logic 0 only if all inputs are logic 1.

6.3.1 Name the gate.

6.3.2 Draw the IEC symbol of the gate.

(2 × 1) (2)

6.4 Draw the switch circuit for the logic gate in QUESTION 6.3. (2)

6.5 Name a gate that takes only one input. (1)

6.6 $X = A + B$ is an equation for a certain logic gate.

Draw the truth table given by this logic gate. (2)
[15]

QUESTION 7

7.1 A PLC needs four basic tools to create a program.

Name TWO of the tools and give ONE function of each. (4)

7.2 What is meant by *online programming*? (2)

7.3 A PLC may have several modes of operation.

When is the Run mode and the Program mode used? (2)

7.4 Name the indicator light that will be shown by a PLC CPU during the following processes:

7.4.1 When the PLC is in programming mode

7.4.2 When the program is in running mode

(2 × 1) (2)
[10]

QUESTION 8

8.1 Define *wavelength* in telecommunication terminology. (2)

8.2 Describe the operation of a multiplexer. (2)

8.3 What is the advantage of using amplitude modulation rather than frequency modulation to transmit signals? (2)

8.4 State TWO disadvantages of analogue signals. (2)

8.5 Name TWO types of data network. (2)
[10]

TOTAL: 100

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