higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

ELECTRONICS
NQF LEVEL 2

(10041012)

27 February 2018 (X-Paper)
09:00–12:00

Nonprogrammable calculators may be used.

This question paper consists of 7 pages.

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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 all your final answers to three decimal places.
5. Write neatly and legibly.

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SECTION A

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 Which ONE of the following is NOT a characteristic of a magnetic line of flux?

A They move from south to north.
B They are continuous.
C They never cross each other.
D They can pass through all materials.

1.1.2 Materials that have a high resistance and stop the flow of current:

A Semiconductors
B Resistance
C Insulators
D Conductors

1.1.3 This is used as a voltage regulator:

A PN junction diode
B Zener diode
C Varactor
D Light-emitting diode

1.1.4 When measuring …, the power should be turned off and the ohmmeter should be connected across the component.

A voltage
B power
C resistance
D current

1.1.5 Which ONE of the following is NOT one of the basic components of a PLC?

A PLC unit
B Programming device
C Sensor
D Connecting cable

(5 × 1) (5)

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

COLUMN A		COLUMN B	
1.2.1	It is used in tuning circuits	A	NAND gate
1.2.2	Energy that cannot be replaced once it has been used	B	Faraday's law
		C	non-renewable energy
1.2.3	Current is directly proportional to voltage and inversely proportional to resistance	D	varactor diode
		E	resitor
1.2.4	Output is logic zero; all inputs are logic 1	F	kinetic energy
		G	capacitor
1.2.5	Electrical device that limits the flow of current	H	Ohm's law
		I	NOR gate

(5 × 1) (5)

1.3 Indicate whether the following statements are TRUE or FALSE. Choose the answer and write only 'true' or 'false' next to the question number (1.3.1–1.3.5) in the ANSWER BOOK.

1.3.1 A multimeter is connected in series with the load when measuring voltage across the load.

1.3.2 Tinning is another word for rusting, caused by the reaction of water and oxygen on a metal.

1.3.3 An invertor or a NOT gate is the only logic gate that takes one input.

1.3.4 Push-to-make buttons is one of the components of a PLC.

1.3.5 Frequency modulation is the process of transmitting sound by changing the amplitude of the radio wave.

(5 × 1) (5)

1.4 Complete the following sentences by writing down only the missing word or words next to the question number (1.4.1–1.4.5) in the ANSWER BOOK.

1.4.1 The output of a … is logic one only if all inputs are logic zero.

1.4.2 … modulation transmits sound by changing the frequency of the radio wave.

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1.4.3 … is when one signal affects another nearby signal.

1.4.4 … refers to cleaning the work area after you have finished your tasks, and cleaning your tools and equipment.

1.4.5 The … of a wave is the number of wavelengths that pass a point in one second. (5 × 1) (5)

[20]

TOTAL SECTION A: 20

SECTION B

QUESTION 2

2.1 List FIVE characteristics of magnetic lines of flux. (5)

2.2 Three resistors, 100 Ω, 15 Ω and 200 Ω, are connected in parallel.

If a 100-V supply is connected to this circuit, calculate the following:

2.2.1 Total resistance of the circuit (3)

2.2.2 Current through each resistor (6)

2.2.3 Colour code for the resistor of 100 Ω assuming that the tolerance is 5% (4)

2.3 Complete the table below by providing the missing information in questions 2.3.1–2.3.4. Write only the answer next to the question number (2.3.1–2.3.4) in the ANSWER BOOK.

NAME OF THE DIODE	**IEC SYMBOL**	**MODE OF OPERATION**	**APPLICATION**
e.g. PN junction diode		Forward bias	Rectification
Zener	2.3.1	2.3.2	Voltage regulation
2.3.3		Reverse bias	2.3.4

(4)

2.4 Draw a basic power supply circuit that has the following:

Step down transformer, bridge rectifier and load. (4)

2.5 Draw output waveforms of a half-wave and a full-wave rectifier circuit. (4)

[30]

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QUESTION 3

3.1 Electrical shock can lead to death or serious injury.

Explain what can cause electrical shock. (5)

3.2 Breakages and excessive tear on electrical equipment can occur frequently. You therefore need to do regular inspections and take precautions to ensure your safety.

List FIVE general points to look for when doing an inspection. (5)

3.3 What causes a dry joint during soldering? (3)

3.4 Why is it important to use a heat-controlled soldering iron? (1)

3.5 What should be the colour of a well-soldered joint? (1)

3.6 State FIVE types of information that are indicated on a job card. (5)

[20]

QUESTION 4

4.1 Convert the following decimal numbers to binary:

4.1.1 23_{10}

4.1.2 19_{10}

(2 × 1) (2)

4.2 Convert the following numbers to their binary equivalent number and complete the calculation in binary number systems:

4.2.1 $23_{10} + 19_{10}$

4.2.2 $23_{10} - 19_{10}$

(2 × 2) (4)

4.3 Use the truth table given below to answer the questions.

INPUT A	INPUT B	OUTPUT C
0	0	1
0	1	0
1	0	0
1	1	0

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4.3.1 Name the gate that gives the OUTPUT C of the truth table above. (1)

4.3.2 Draw the switch circuit for the logic gate given in QUESTION 4.2.1. (3)

4.4 Draw the circuit symbol (IEC) for the logic gate given by the following equation:

$X = \overline{AB}$ (2)

4.5 Indicate whether the items in the list below are INPUT PERIPHERALS or OUTPUT PERIPHERALS. Write only 'input peripheral' or 'output peripheral' next to each item in the ANSWER BOOK.

limit switches; printer; microphone; monitor; keyboard; speaker

(6)
[18]

QUESTION 5

5.1 Briefly explain the THREE transmission media that are employed in telecommunications. (3 × 2) (6)

5.2 Show, by means of schematic diagrams, THREE different types of data networks. (3 × 2) (6)
[12]

TOTAL SECTION B: 80
GRAND TOTAL: 100

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