



**higher education  
& training**

Department:  
Higher Education and Training  
**REPUBLIC OF SOUTH AFRICA**

**NATIONAL CERTIFICATE (VOCATIONAL)**

**ELECTRICAL SYSTEMS AND CONSTRUCTION  
NQF LEVEL 2**

(12041032)

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

**This question paper consists of 8 pages.**

197Q1N2002

**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. Start each question on a new page.
  5. 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 According to the Wiring Code SANS 10142-1, it is not required to earth an electrical installation in South Africa. ⚡
- 1.1.2 A bell tester can be used to test the operation of an earth leakage relay.
- 1.1.3 An earth continuity conductor connects the consumer's earth terminal to exposed conductive parts of an installation.
- 1.1.4 All socket outlets in a circuit must be connected in series.
- 1.1.5 According to SANS 10142-1, a bonding conductor must be made of copper and must have a cross-sectional area that is at least 2,5 mm<sup>2</sup>.
- 1.1.6 In a lighting circuit, all neutral conductors are connected directly to the lamp holder and never to the switch.
- 1.1.7 Once a circuit has been isolated (switched off), it is not necessary to test if it is energised before you start working.
- 1.1.8 A Certificate of Compliance must be issued before the installation is inspected and tested.
- 1.1.9 A 40 A circuit breaker is used to protect a geyser circuit.
- 1.1.10 A cooking appliance must be controlled by a disconnecting switch (double pole isolator). ⚡ (10 × 1) (10)
- 1.2 You must plan and prepare to install a light in a passage. The light must be controlled by a two-way switch.
- 1.2.1 What is the current rating of the circuit breaker that should be used to protect the circuit? (1)
- 1.2.2 What size conductors must be used to wire the circuit? ⚡ (1)
- 1.2.3 List any FIVE tools that you would use to install the circuit. (5)

- 1.3 An insulation resistance test between conductors and earth has to be performed on a single-phase domestic installation.
- 1.3.1 What test instrument would you use? ⚡ (1)
- 1.3.2 What scale would you select on the test instrument? (1)
- 1.3.3 The reading obtained during the test is 500  $\Omega$ .  
Is this reading acceptable? Motivate your answer. (2)
- 1.3.4 What does the above reading indicate to you regarding the conductors used in the installation? (2)
- 1.4 Why is it important to earth electrical installations? (2)
- [25]**

## QUESTION 2

2.1 State the purpose of wireways in electrical installations. ⚡ (3)

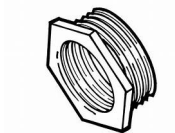
2.2 The components below are used when installing conduits.

Identify each component and state its use.

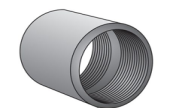
2.2.1



2.2.2



2.2.3



(3 × 2) (6)

2.3 Britannia joints are used for joining hard-drawn copper wires that are under considerable tension when in use.

2.3.1 Explain the procedure to make the abovementioned joint. ⚡ (6)

2.3.2 List any TWO hand tools that you would use to make the joint. (2)


2.4 What does the SANS 101421-1 regulation state about flexible metal conduit and earthing?

(3)  
**[20]**

**QUESTION 3**

- 3.1 Complete the following sentence by filling in the missing words. Write only the words next to the question number (3.1.1–3.1.3) in the ANSWER BOOK.

Without derogating from any specific duty imposed on employers or users of machinery by the Act, the employer or user shall provide 3.1.1 (...) and (3.1.2) ... insulated stands, trestles, mats or such other protective equipment as may be necessary to (3.1.3) ..., for use by persons engaged in, working on or in close proximity to live (live; alive) electrical machinery or dead electrical machinery which may become live. (3)

- 3.2 All motors have to be cleaned during their lifetime. 

List THREE methods used to clean electrical machinery. (3)

- 3.3 With the aid of TWO neat labelled diagrams, show TWO methods that can be used to reverse the direction of rotation of a long shunt compound motor. (6)

- 3.4 While testing the continuity of a centrifugal switch on a single-phase induction motor, an infinity reading was recorded.



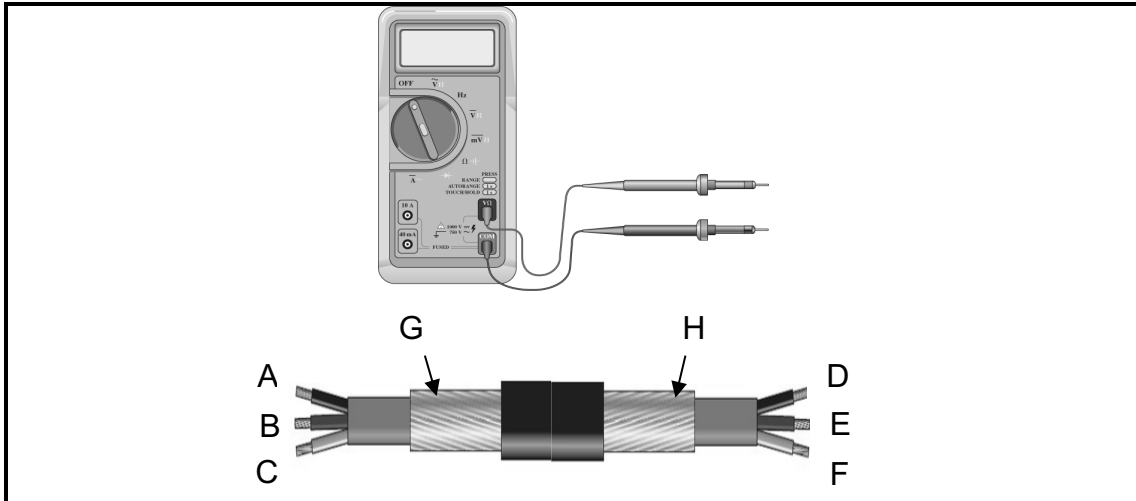
Is this value acceptable? Motivate your answer. (3)

**[15]**

**QUESTION 4**

4.1 Name THREE tests that must be conducted on switches and isolators to ensure they are in good working order. (3)

4.2 FIGURE 1 shows a multimeter and a three-core steel wire armoured cable. Study FIGURE 1 and answer the questions. ⚡



**FIGURE 1**

4.2.1 Explain how you would conduct a continuity test on the steel wire armoured cable. Use the letters A–H in your explanation. (5)

4.2.2 On completion of the above test, an infinity reading on one of the conductors was recorded.

Is this reading acceptable? Motivate your answer. ⚡ (2)

4.3 Choose a test from COLUMN B that matches a component in COLUMN A. Write only the letter (A–F) next to the question number (4.3.1–4.3.5) in the ANSWER BOOK.

COMPONENT		TEST	
4.3.1	Thermostat	A	earth resistance test
4.3.2	Earth leakage relay	B	power off or on
4.3.3	Circuit breaker	C	continuity test
4.3.4	Fuses ⚡	D	voltage test
4.3.5	Transformer	E	overload tripping test
		F	sensitivity test

(5 × 1) (5)  
[15]

**QUESTION 5**

5.1 It is vital to protect your face and eyes from hazards while installing metering units.

5.1.1 Name any THREE hazards against which you must protect your face and eyes. ⚡

5.1.2 Name THREE face and eye protection equipment. (2 × 3) (6)

5.2 You must observe certain safety precautions when removing and replacing faulty metering units.

List FIVE of these safety precautions. (5)

5.3 Study FIGURE 1 and answer the questions.



**FIGURE 2**

5.3.1 Identify the measuring instrument in FIGURE 2. ⚡ (1)

5.3.2 What is the purpose of the measuring instrument when used in a domestic installation? (3)  
**[15]**

**QUESTION 6**

6.1 Complete the following sentences by filling in the missing word or words. Write only the word or words next to the question number (6.1.1–6.1.4) in the ANSWER BOOK.

6.1.1 Solar panels generate power by converting ... energy to electrical energy. ✂

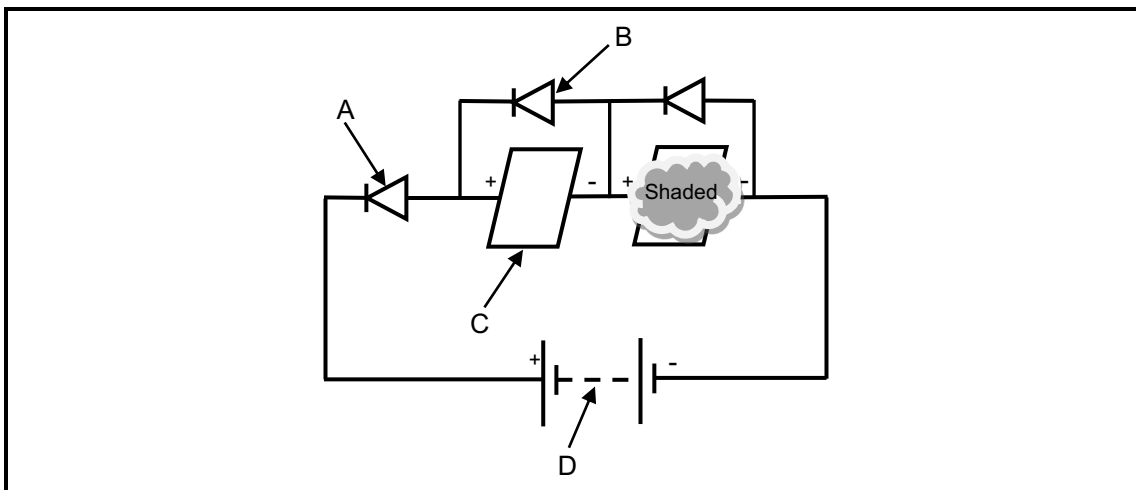
6.1.2 A ... bank is used to store electricity received from the solar panels.

6.1.3 A power inverter converts the low voltage DC to ... .

6.1.4 Charge controllers are used to maintain the proper charging ... on the batteries. ✂

(4 × 1) (4)

6.2 Study the diagram in FIGURE 3 and answer the questions:



**FIGURE 3**

6.2.1 Identify the components labelled A to D. (4)

6.2.2 What is the function of component A? (2)  
**[10]**

**TOTAL: 100**