higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

ELECTRICAL SYSTEMS AND CONSTRUCTION
NQF LEVEL 2

(12041032)

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

This question paper consists of 8 pages.

461Q1N2217

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

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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 (1.1.1–1.1.10) in the ANSWER BOOK.

1.1.1 Socket outlets are connected in …

A parallel with each other.
B series with each other.
C series-parallel.
D None of the above

1.1.2 When a geyser is turned on and it is found that the water is not heating:

A Faulty thermostat
B Faulty element
C Faulty isolator
D All of the above

1.1.3 Earthing means …

A red wire connected to the ground.
B electrically connecting to the general mass of the earth.
C connecting together to the same electrical potential.
D None of the above

1.1.4 Used to secure conduit pipes:

A Adaptor
B Cable gland
C Saddles
D Coupling

1.1.5 Parts of an electrical installation that must be bonded:

A Metal roof
B Metal gutters
C Steel pipes
D All of the above

1.1.6 Current that passes through the body of a person:

A Over-current
B Shock current
C Fault current
D None of the above

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1.1.7 PPE stands for …

A person protective earth.
B protective place equipment.
C protect people and equipment.
D None of the above

1.1.8 A continuity test is performed while the installation is disconnected from the supply, and the correct reading should be …

A 5 Ω.
B 0 Ω.
C 50 Ω.
D 10 Ω.

1.1.9 The standard frequency at which power is generated in our country is …

A 16 Hz.
B 25 Hz.
C 50 Hz.
D 60 Hz.

1.1.10 Causes of electrical accidents:

A Fatigue
B Poor housekeeping
C Lack of knowledge
D All of the above

(10 × 1) (10)

1.2 Draw a neat, labelled sketch of an electrical circuit showing how two luminaires are controlled by their own switches. (5)

1.3 During your planning it is important to take certain factors into consideration to ensure that the task is completed in accordance with acceptable standards.

List any SIX such factors to consider when you are assigned a task. (6)

1.4 Briefly explain the difference between *mandatory rules* and *permissive rules* as contained in SANS 10142-1. (4)

[25]

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QUESTION 2

2.1 A safe working environment is achieved by avoiding contact with electricity.

State FIVE guidelines for creating a safe environment. (5)

2.2 Fill in the missing words in the following statement extracted from regulation 6.3.7.2. Write only the word next to the question number (2.2.1–2.2.6) in the ANSWER BOOK.

Joints and terminations shall not adversely affect the (2.2.1) … carrying capacity, insulation resistance or the (2.2.2) … continuity of the cable, core or (2.2.3) … in which they are made. Joints and terminations shall not be made in any conductor, bend, elbow or tee-piece of a (2.2.4) … and shall not allow the strands of a stranded conductor to (2.2.5) … . Joints and terminations shall not require strands of a stranded conductor to be (2.2.6) … to allow connection of the conductors.

(6 × 1) (6)

2.3 State the FOUR steps to be followed when making a Scotch cast joint. (4)

2.4 A draw tape is used to draw wire conductors through a conduit.

Name the TWO types of draw tapes used in the electrical industry. (2)

2.5 A task is incomplete until all paperwork has been completed and all policies and procedures have been followed.

Name any THREE types of administrative work that has to be completed. (3)
[20]

QUESTION 3

3.1 Choose an item from COLUMN B that matches a description in COLUMN A. Write only the letter (A–F) next to the question number (3.1.1–3.1.5) in the ANSWER BOOK.

COLUMN A		COLUMN B	
3.1.1	Must run at the desired speed and function as intended	A	reversing
3.1.2	Controllers will have built-in protection to safeguard the operator from unsafe conditions	B	protection from damage
3.1.3	Disconnect the motor directly from the supply and let the motor stop by itself	C	running
3.1.4	Controllers will gradually increase or decrease the speed of a motor as and when required	D	speed control
3.1.5	Controller must be able to stop the motor in case of an emergency	E	safety of operator
		F	stopping

(5 × 1) (5)

3.2 Draw a neat, fully labelled circuit diagram of a shaded-pole motor. (5)

3.3 Coupling is a component used to connect a drive shaft and a driven part.

List THREE main types of couplings used in industry. (3)

3.4 State TWO applications of DC shunt motors. (2)

[15]

QUESTION 4

4.1 Indicate whether the following statements are TRUE or FALSE by writing write only 'True' or 'False' next to the question number (4.1.1–4.1.5) in the ANSWER BOOK.

4.1.1 A cartridge fuse consists of a tube with metal end caps.

4.1.2 Circuit breakers are devices for making and breaking current under normal conditions.

4.1.3 A voltage test can be carried out when the power is switched off.

4.1.4 A mechanical operation test is performed using a multimeter.

4.1.5 A resistance below 1 MΩ is considered acceptable when conducting an insulation resistance test.

(5 × 1) (5)

4.2 List the THREE tests that must be performed when conducting the insulation resistance test on transformers. (3)

4.3 List any FOUR electrical components that can be tested when conducting fault-finding on electrical circuits. (4)

4.4 Briefly explain how a fuse can be tested while power is switched off. (3)

[15]

QUESTION 5

5.1 As an electrician, you have been given a job card to replace a faulty electric motor.

State the importance of the job card. (1)

5.2 A wide variety of hand tools, power tools and equipment is used when doing electrical installations.

Explain how hand tools should be stored in the following cases:

5.2.1 Small jobs that are often done on site (3)

5.2.2 Big jobs done in a workshop (3)

5.3 Draw a neat, labelled diagram to show a simple TN-S earthing system. (4)

5.4 Marking off or layout means the process of transferring a design or pattern to a workpiece, as the first step in the manufacturing process.

5.4.1 Name TWO different types of marking media.

5.4.2 Name TWO types of punches used for the purposes of locating holes and making light punch marks.

(2 × 2) (4)

[15]

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QUESTION 6

6.1 Workers in the solar energy industry are potentially exposed to a variety of hazards.

List FOUR typical hazards associated with the installation of solar panels. (4)

6.2 A PV array is the full energy-generating equipment that is composed of a different number of panels of a PV module.

List any FOUR applications of PV arrays. (4)

6.3 Three PV modules of 12 V, 3 A each are connected in parallel. Refer to FIGURE 1 below and answer the questions that follow.

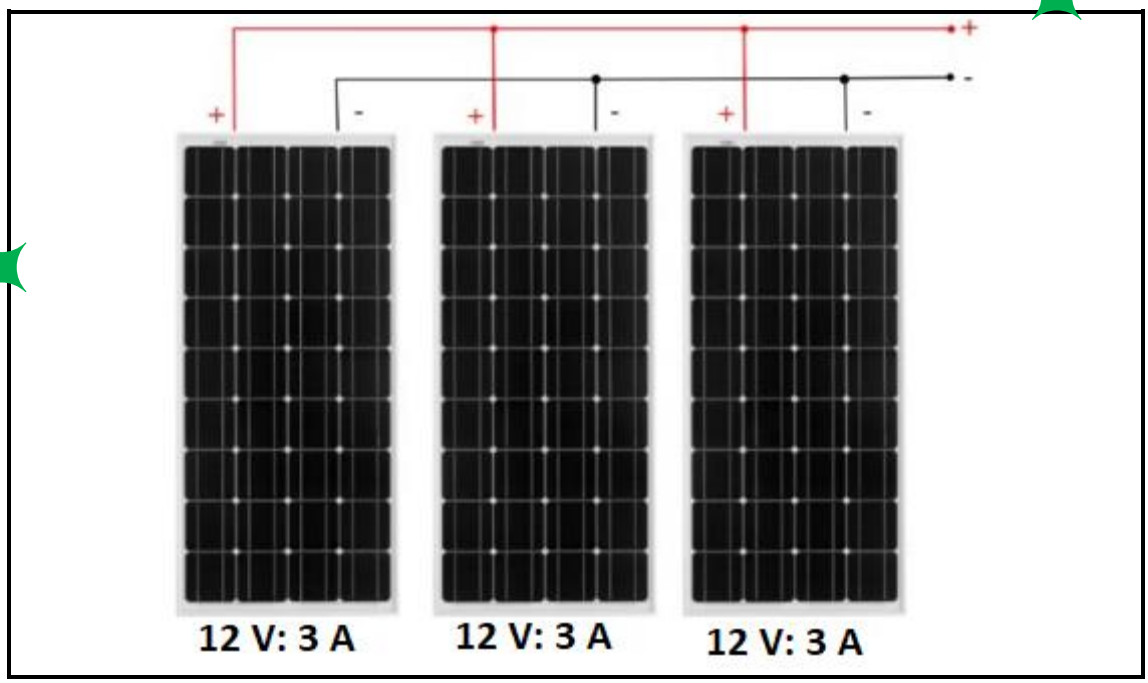


FIGURE 1

6.3.1 What is the total output voltage?

6.3.2 What is the total current?

(2 × 1) (2)

[10]

TOTAL: 100

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