higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

ELECTRICAL SYSTEMS AND CONSTRUCTION
NQF LEVEL 3

(12041033)

9 March 2018 (X-Paper)
09:00–12:00

This question paper consists of 6 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. Write neatly and legibly.

NCV

QUESTION 1

1.1 Before starting a job, an electrician must carefully study and understand the electrical plan of a building.

Give THREE reasons for studying the electrical plan of a building before the commencement of work. (3)

1.2 Complete the following sentences by using the word or words in the list below. Write only the missing word or words next to the question number (1.2.1–1.2.4) in the ANSWER BOOK.

600 mm; surface-mounted; fixed; luminaires; bathroom; 100 mm; conductors; thermal damage

1.2.1 Regulation 6.14.1.1: A single-phase circuit that supplies ... only can supply any number of luminaires.

1.2.2 Regulation 6.14.2.1: ... luminaires shall be selected and installed such that thermal damage to the mounting surface is avoided.

1.2.3 Regulation 6.14.3.1: The luminaire and pendant shall not rotate more than one complete revolution to prevent damage to the ...

1.2.4 Regulation 6.14.3.2: A luminaire pendant which is longer than ... and is not suitably stayed shall have a flexible joint.

(4 × 1) (4)

1.3 You are required to install TWO single-phase socket outlets from one circuit breaker in the electrical workshop.

Draw a neat, fully labelled wiring diagram for the connection. (8)

1.4 PVC conduit is widely used to protect conductors in electrical installations.

Give THREE guidelines (Rules) to follow when bending PVC conduit. (3)

1.5 Name THREE types of cables used in a domestic electrical installation. (3)

1.6 Describe the function of each of the following tools used during an electrical installation:

1.6.1 A reamer

1.6.2 A stock and die set

(2 × 2) (4)

[25]

QUESTION 2

2.1 A distribution board is an enclosure that contains electrical equipment for the distribution or control of electrical power from one or more incoming circuits to one or more outgoing circuits.

2.1.1 Name THREE components found in a domestic consumer's distribution board. (3)

2.1.2 Briefly explain the purpose of each component given in QUESTION 2.1.1 above. (3 × 2) (6)

2.2 The table below shows one of the tests that can be done on an electrical installation.

Complete the following table by writing down the missing word or words next to the question number (2.2.1–2.2.4) in the ANSWER BOOK.

TYPE OF TEST DONE	EXPLAIN HOW TEST IS CONDUCTED	INDICATE MEASURING INSTRUMENT USED	ACCEPTABLE READING
Earth continuity and bonding	2.2.1 ... (1) 2.2.2 ... (3)	2.2.3 ... (1)	2.2.4 ... (1)

(6)

2.3 Indicate whether the following statements are TRUE or FALSE. Choose the answer and write only 'true' or 'false' next to the question number (2.3.1–2.3.10) in the ANSWER BOOK.

2.3.1 Only a registered person may issue a certificate of compliance.

2.3.2 A test report consists of five different sections.

2.3.3 Instruments used to test installations must be regularly calibrated and SABS approved.

2.3.4 Section 3 of the test report deals with the location of the installation.

2.3.5 Distribution boards, earth-leakage relays and circuit-breakers do not need to be permanently marked and labelled.

2.3.6 The prospective short-circuit current may be measured with a fault-current meter where the current rating of the main switch is more than 100 A.

2.3.7 Exposed conductive parts do not need to be bonded to the earth continuity conductor.

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2.3.8 An earth continuity conductor may be identified by the colour green-yellow.

2.3.9 An earth-leakage relay should trip between 50% and 100% of its rated residual current when tested.

2.3.10 The difference in voltage between the point of control and point of outlet shall not exceed 5% of the standard or declared voltage.

(10 × 1) (10)
[25]

QUESTION 3

3.1 A risk assessment forms part of a company's safety rules and regulations and is an important step in protecting workers against worksite hazards.

State THREE questions that one could ask oneself when carrying out a risk assessment before doing fault-finding. (3)

3.2 Each time a single-phase capacitor-start induction-run motor is started, the earth-leakage relay trips.

As an electrician you are called to fix the problem.

3.2.1 State FOUR possible faults that the motor might be experiencing. (4)

3.2.2 Which instrument will you use? Also explain how you will carry out fault-finding on the motor. (3)

3.2.3 What could the expected test results be? (2)

3.3 Maintenance relates to the restoration, calibration and replacement of electrical equipment.

Name THREE types of maintenance procedures employees are exposed to. (3)
[15]

QUESTION 4

4.1 To complete work safely and efficiently, adequate information must be available about the work to be done on a low-voltage network.

State FOUR factors that must be considered when planning for electrical work on low-voltage networks. (4)

4.2 Two earthing systems that are used in South Africa are the TN-C-S and the TN-S earthing systems.

Briefly describe a TN-C-S earthing system. (3)

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4.3 You finished doing work on a low-voltage network.

State THREE activities that need to be done before restoring the power supply on a low-voltage network. (3)

[10]

QUESTION 5

5.1 Calculate the voltage drop across a power cable if a current of 4,0 A flows through it. Take the resistance of the cable as 1,6 Ω. (3)

5.2 What does SANS 10142-1 state with regard to a suspended luminaire that is installed in a fixed bath? (2)

5.3 Fluorescent lamps are highly efficient and they last longer than incandescent lamps.

State ONE function of a starter found in a fluorescent-lamp fitting. (2)

5.4 A preventive maintenance plan should be developed and implemented in the workplace to keep lighting systems in good working order.

State THREE items that should be included in the maintenance plan for lighting systems. (3)

5.5 State THREE disadvantages of a low power factor. (3)

5.6 Briefly explain the purpose of a ripple relay. (2)

[15]

QUESTION 6

6.1 Installing solar panels is a high-risk activity.

Name TWO serious injuries that may result from installing solar panels at a worksite. (2)

6.2 Draw a neat, fully labelled block diagram of a stand-alone photovoltaic system for AC loads. (6)

6.3 Name TWO main types of solar water heaters. (2)

[10]

TOTAL: 100

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