higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T880**(E)**(M28)T

# NATIONAL CERTIFICATE

# INSTALLATION RULES
(First Paper)

(11040412)

**28 March 2019 (X-Paper)**
**09:00–12:00**

**This question paper consists of 6 pages and 1 table.**

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# DEPARTMENT OF HIGHER EDUCATION AND TRAINING
# REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE
INSTALLATION RULES
(First Paper)
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. ALL answers must comply with the relevant codes and/or requirements of the SANS publications (latest edition) and the Occupational Health and Safety Act regulations.
6. The answer need NOT to be word-perfect in all aspects according to the publications, but they must show that the candidate fully understands the context of the relevant question.
7. The necessary tables are supplied.
8. Candidates must pass PAPER 1 and PAPER 2 with 50% each.
9. Candidates may write both examination papers during the same examination period.
10. Candidates need not pass both papers during the same trimester. However, they must pass the second paper within 12 months of the first OR they must rewrite both examinations.
11. If a candidate obtains 75 out of 100 marks in ANY ONE of the examinations, he/she will be permanently exempted from rewriting that examination. An appropriate statement will be issued.
12. For accreditation purposes, ALL candidates must meet the requirements prescribed by the Department of Labour.
13. NO condonations will be considered.
14. Write neatly and legibly.

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## QUESTION 1: SANS 10142-1 OF 2017: SCOPE

1.1 State TWO lighting installations to which this standard is applicable. (2)

1.2 Give EIGHT installations to which this part of SANS 10142 is NOT applicable. (8)
**[10]**

## QUESTION 2: SANS 10142-1 OF 2017: DEFINITIONS

Indicate whether the following statements are TRUE or FALSE. Choose the answer and write only 'True' or 'False' next to the question number (2.1–2.10) in the ANSWER BOOK.

2.1 Portable appliance – Appliance that is moved in the course of normal operations

2.2 Exposed conductive part – Conductive part that is not a live part but can become live under fault conditions

2.3 Extraneous conductive part – Conductive part that forms part of the electrical installation

2.4 Conduit – Pipe, usually of diameter not exceeding 50 mm, that allows conductors and cables in electrical installations to be drawn in and to be replaced

2.5 Overload current – Overcurrent that occurs when rated current is exceeded

2.6 Protective earthing – Earthing of a point or points in a system or in an installation or in equipment which is necessary for purposes other than safety

2.7 Functional earthing – Earthing of a point or points in a system or in an installation or in equipment for purpose of safety

2.8 Double insulation – Comprises both basic insulation and supplementary insulation

2.9 Emergency lighting – System that provides sufficient illumination to allow all occupants of a place of assembly to see clearly enough during a performance to move around or to leave

2.10 Safety supply – Supply of electricity that is obtained from an isolated generator or a battery that provides a non-earthed supply

(10 × 1) **[10]**

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## QUESTION 3: SANS 10142-1 OF 2017: FUNDAMENTAL REQUIREMENTS

3.1 Explain *fundamental requirements regarding temperature of electrical equipment*. (5)

3.2 Fully explain *requirements regarding basic provisions for voltage drop in an AC circuit*. (5)
**[10]**

## QUESTION 4: SANS 10142-1 OF 2017: BATHROOMS, SHOWERS, SPAS

4.1 Give THREE requirements regarding protection against electric shock. (3 × 2) (6)

4.2 Which fixed equipment may be installed in zone 0 in a bathroom? (1)

4.3 State THREE conditions for the installation of heating units, intended for heating the location, embedded in the floor in zones 1, 2 and 3. (3)
**[10]**

## QUESTION 5: SANS 10142-1 OF 2017: ALTERNATIVE SUPPLIES

5.1 Give FOUR examples of alternative supplies. (4 × ½) (2)

5.2 What is the requirement when the alternative supply is intended to provide a supply to an installation that is not connected to the main supply, or to provide a supply as a switched alternative to the main supply? (4)

5.3 What are the requirements for the installation of alternative supplies remotely from the installation or from one another where it is not possible to make use of a single, neutral bar which is earthed? (4)
**[10]**

## QUESTION 6: SANS 10142-1 OF 2017: MEDICAL LOCATIONS

6.1 Give FIVE examples of equipment in medical locations for which changeover of the power supply source can exceed 30 seconds. (5)

6.2 Complete the following sentences on power supply sources with a changeover period of up to 0,5 sec by filling in the missing words. Write only the words next to the question number (6.2.1–6.2.5) in the ANSWER BOOK.

In the event of a voltage failure of one or more (6.2.1 …) at the distribution board, a special (6.2.2 …) supply source capable of maintaining luminaires of (6.2.3 …) and other essential life supporting and monitoring equipment for a minimum period of (6.2.4 …) is required. The safety power supply shall restore the supply within a changeover period not exceeding (6.2.5 …). (5)
**[10]**

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## QUESTION 7: SANS10142-1 of 2017: ANNEX F: DETERMINING CONDUIT SIZE

7.1 You are given five socket outlet circuits using a 4 mm² single-core conductor with a 2,5 mm² bare earth conductor and four light circuits using 2,5 mm² single-core conductors with a 2,5 mm² bare earth conductor.

7.1.1 Calculate a conduit size suitable for the socket outlet circuits.

7.1.2 Calculate a conduit size suitable for the light circuits.

(2 × 2) (4)

7.2 You have been supplied only with 25 mm conduit to do a particular installation and are required to leave 15% space in each conduit.

7.2.1 Show with calculations how you will do this for socket outlets.

7.2.2 Show with calculations how you will do this for light circuits.

(2 × 3) (6)

**[10]**

## QUESTION 8: OCCUPATIONAL HEALTH AND SAFETY ACT, 85 OF 1993

Issuing of certificate of compliance

8.1 Fully explain when an accredited person may issue a certificate of compliance for a full installation or part of an installation. (6)

8.2 What shall an accredited person do if he/she detects a fault or faults prior to issuing the certificate of compliance? (4)

**[10]**

## QUESTION 9: SANS 10292 OF 2001: EARTHING OF LOW-VOLTAGE (LV) DISTRIBUTION SYSTEMS

9.1 Give THREE instances for which TNC-S system earthing can be used/applied. (3)

9.2 Give THREE types of earth electrodes that are commonly used. (3)

9.3 Give FOUR types of system earthing extensions. (4)

**[10]**

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**QUESTION 10: SANS 10198-2 OF-2004: SELECTION OF CABLE TYPE AND METHODS OF INSTALLATION**

10.1 Give TWO basic functions that an electric power cable must perform. (2)

10.2 Give TWO methods of reducing induced voltage when power cables run parallel with telecommunication cables for some distance. (2)

10.3 Give THREE methods of installing a cable using an unrestrained system which allows for expansion and contraction of cables to occur. (3)

10.4 What is an advantage of using an unrestrained system? (1)

10.5 Complete the following sentences by filling in the missing words. Write only the words next to the question number (10.5.1–10.5.2) in the ANSWER BOOK.

10.5.1 When a cable heats up and cools down due to cyclic changes in load, it tends to …

10.5.2 When a short circuit occurs in a distribution system, all cables feeding the faults will, as a result of the short-circuit current, be subjected to electromagnetic forces that will tend to …

(2 × 1) (2)

**[10]**

**TOTAL: 100**

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## TABLES

**Table 6.23 — Values of *C* for conductor nominal cross-sectional area**

| 1 | 2 |
|---|---|
| **Nominal cross-sectional area of conductor** $mm^2$ | **Value of *C*** |
| 1 | 8 |
| 1,5 | 10 |
| 2,5 | 14 |
| 4 | 17 |
| 6 | 22 |
| 10 | 30 |
| 16 | 42 |
| 25 | 65 |
| 35 | 84 |
| 50 | 118 |
| 70 | 152 |

**Table 6.24 — Values of *K* for conduit diameter**

| 1 | 2 |
|---|---|
| **Value of *K*** | **Conduit diameter** mm |
| 90 | 20 |
| 144 | 25 |
| 240 | 32 |
| 398 | 40 |
| 640 | 50 |

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