



higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T500(E)(A5)T

NATIONAL CERTIFICATE

ELECTRICAL TRADE THEORY N1

(11041861)

5 April 2018 (X-Paper)

09:00–12:00

This question paper consists of 5 pages and 1 formula sheet.

DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA
NATIONAL CERTIFICATE
ELECTRICAL TRADE THEORY N1
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. Sketches must be large, neat and fully labelled.
 5. Write neatly and legibly.
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QUESTION 1

Indicate whether the following statements are TRUE or FALSE. Choose the answer and write only 'true' or 'false' next to the question number (1.1–1.15) in the ANSWER BOOK.

- 1.1 An earth leakage test is carried out with a connected power supply.
- 1.2 A rigid metallic wireway shall be made electrically continuous.
- 1.3 Stationary appliances are fastened or otherwise secured at a specific location.
- 1.4 Single-phase circuits that only supply socket outlets rated at no more than 16 amperes shall have overcurrent protection.
- 1.5 A short-circuit fault occurs when the insulation breaks between the conductors.
- 1.6 A fuse is a safety device that will blow up if the current flowing through it goes beyond a specified value.
- 1.7 When bending a cable the radius may not be greater than specified by the manufacturer.
- 1.8 Geysers must be controlled by a switch disconnecter.
- 1.9 Cooking appliances that are rated at more than 16 A must be on a separate circuit.
- 1.10 The maximum resistance of an earth continuity path is 1,7 KΩ.
- 1.11 An earthing lead is a conductor with which connection is made to a consumer's earthing terminal.
- 1.12 The colour black is used to identify the neutral conductor in domestic installations.
- 1.13 A light switch is always connected in series with the neutral wire, never with the live wire.
- 1.14 A glass cartridge fuse contains a thin wire that has a low melting point.
- 1.15 Doubling the areas of the plates in a capacitor will also double its capacitance.

(15 × 1) **[15]**

QUESTION 2

- 2.1 State FIVE safety precautions that must be observed when working with electric equipment in a workshop. (5)
- 2.2 What can be done to reduce the dangers involved in working with portable tools? (4)
- 2.3 Name TWO types of gloves. (2)
- [11]**

QUESTION 3

- 3.1 Name TWO devices that are able to generate an electromotive force. (2)
- 3.2 State Ohm's law. (4)
- 3.3 Two unknown resistors, R_1 and R_2 , are connected in parallel across a 12 volt supply. The current flow through R_1 is 1,5 amperes and 2,5 amperes through R_2 .
- Calculate each of the following:
- 3.3.1 Total current flow through the circuit (3)
- 3.3.2 Total resistance of the circuit (3)
- 3.3.3 Values of the unknown resistors (4)
- 3.4 What effect does the internal resistance have on the terminal voltage? (3)
- [19]**

QUESTION 4

- 4.1 Name THREE types of magnets. (3)
- 4.2 Write down the equation that is used to calculate the magnetomotive force of a magnetic circuit. (2)
- 4.3 What is an *ideal transformer*? (2)
- 4.4 An 11 KV/220 V single-phase step-down transformer has 3 600 primary turns.
- Calculate each of the following:
- 4.4.1 Transformer ratio
- 4.4.2 Number of secondary turns
- 4.4.3 Primary current if 200 A is drawn from the secondary
- (3 × 2) (6)
- [13]**

QUESTION 5

- 5.1 Explain the purpose of slip rings on an alternator. (2)
- 5.2 What does the term *frequency* on alternating current mean? (3)
- 5.3 Name FOUR advantages of using a three-phase power supply. (4)
- [9]**

QUESTION 6

- 6.1 What is an *electrical cell*? (3)
- 6.2 State FOUR advantages of using a dry cell. (4)
- 6.3 Explain in detail why the secondary winding must be short-circuited before an ammeter is removed from a current transformer. (7)
- 6.4 State TWO advantages of a moving-coil meter. (2)
- 6.5 State the voltage generated by a hand-driven insulation tester (Megger). (1)
- [17]**

QUESTION 7

- 7.1 Choose a value (% relative conductivity) from COLUMN B that matches a word or words in COLUMN A. Write only the letter (A–D) next to the question number (7.1.1–7.1.4) in the ANSWER BOOK.

COLUMN A		COLUMN B	
7.1.1	Gold	A	14%
7.1.2	Brass	B	22%
7.1.3	Steel wire	C	73%
7.1.4	Lead	D	23%

(4 × 2)

[8]**QUESTION 8**

- 8.1 State FOUR properties of a capacitor. (4)
- 8.2 Name the colours that would be painted on the rings of a carbon resistor with a value of $25\text{ M}\Omega \pm 5\%$. (4)
- [8]**

TOTAL: 100

ELECTRICAL TRADE THEORY N1**FORMULA SHEET****RESISTORS**

$$R = \frac{V}{I}$$

$$R_T = R_1 + R_2 + R_3 + \dots$$

$$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \dots$$

POWER

$$P = V \times I$$

$$P = I^2 \times R$$

$$P = \frac{V^2}{R}$$

ENERGY

$$W = P \times t$$

$$W = VI \times t$$

$$W = I^2 R \times t$$

$$W = \frac{V^2}{R} \times t$$

CELLS

$$E = V + (I \times r)$$

$$R_T = R + r$$

$$I = \frac{V}{R}$$

$$I = \frac{E}{(R + r)}$$

RESISTIVITY

$$R = \frac{\rho \times \ell}{a}$$

$$a = \frac{\pi \times d^2}{4}$$

TEMPERATURE COEFFICIENT

$$R_t = R_o (1 + L_o t)$$

TRANSFORMERS

$$\frac{V_1}{V_2} = \frac{N_1}{N_2} = \frac{I_2}{I_1}$$

CAPACITORS

$$C_T = C_1 + C_2 + C_3 + \dots$$

$$\frac{1}{C_T} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3} + \dots$$

FREQUENCY

$$f = np$$

$$f = \frac{1}{T}$$