higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T380**(E)**(J28)T

# AUGUST EXAMINATION

# NATIONAL CERTIFICATE

# ELECTRICAL TRADE THEORY N1

(11041861)

**28 July 2016 (X-Paper)**
**09:00–12:00**

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

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

NATIONAL CERTIFICATE
ELECTRICAL TRADE THEORY N1
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. 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 (1.1–1.20) in the ANSWER BOOK.

1.1 Good housekeeping means and increases in production and better working conditions.

1.2 The tool-rest of a grinding wheel must not be more than 3 mm from the wheel.

1.3 Energy is the amount of work done in a specific time.

1.4 The formula used to calculate electrical current is V = I + R.

1.5 Keepers are used on the poles of a magnet when stored for long periods of time.

1.6 Pulsating direct current can be increased or decreased with the aid of transformers.

1.7 The magnetic field around a conductor can be indicated with pieces of paper.

1.8 Secondary cells have a long lifespan.

1.9 The segments of a commutator are spaced with mica.

1.10 RMS value is 0,637 of the maximum value.

1.11 In a moving-coil instrument no coil is connected to the supply.

1.12 Flexible conduit may be used for the end connection of fixed appliances.

1.13 Flame-proof appliances must be used in spray-painting booths.

1.14 In the right-hand grip rule, the thumb will indicate the direction of the current flow.

1.15 Non-metallic conduit may not be threaded.

1.16 Glass is a good conductor of electricity.

1.17 Carbon and copper are used to manufacture motor brushes.

1.18 Socket outlets may not be installed within a 2 m radius of a water tap unless it has earth-leakage protection.

1.19 Geysers must be controlled by a switch disconnector or a socket outlet.

1.20 A zener diode is also known as a current-reference diode.

(20 x 1) **[20]**

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## QUESTION 2

2.1 Why is housekeeping important and desirable? (4)

2.2 State FIVE of the main causes of fire. (5)
**[9]**

## QUESTION 3

3.1 In the equation I = (V ÷ R) what electrical quantities do the three letters represent and what are the units used for each of these quantities? (6)

3.2 Two resistors of values 10 Ω and 20 Ω are connected in parallel across a 30 V supply.

Draw a neat, fully labelled schematic diagram of the circuit. (5)

3.3 Making use of the data given above, calculate the following electrical quantities:

3.3.1 The total resistance of the circuit (3)

3.3.2 The total current drawn from the supply (2)

3.3.3 The current flowing through each resistor (4)

3.3.4 The energy consumed by the circuit in two hours (4)
**[24]**

## QUESTION 4

4.1 Explain how the direction of the flux in a conductor relative to the current can be determined by means of the right-hand rule. (6)

4.2 A single-phase transformer has a supply voltage of 220 V and a primary current of 10 A. The number of windings on the primary coil is 250 turns and on the secondary coil is 50 turns.

Calculate the following:

4.2.1 The turns-ratio (2)

4.2.2 The secondary voltage (3)

4.2.3 The secondary voltage current (3)
**[14]**

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## QUESTION 5

5.1 State FOUR conditions under which rigid non-metallic wireways shall be used. (4)

5.2 Draw the wiring symbol for each of the following:

5.2.1 Fuse

5.2.2 Battery

5.2.3 Earth connection

5.2.4 Bell

5.2.5 Voltmeter

5.2.6 Variable resistor

(6 x 1) (6)

5.3 Define a circuit breaker, and state its purpose. (4)
**[14]**

## QUESTION 6

6.1 Name TWO conductors generally used in practice. (2)

6.2 Name THREE properties of a good insulating material. (3)

6.3 Can carbon be used to wire domestic installations? (2)

6.4 What is the purpose of the bending spring? (2)
**[9]**

## QUESTION 7

7.1 State TWO advantages of a moving-coil instrument. (2)

7.2 Name THREE tests that an accredited person must carry out on a new electrical installation before a certificate of compliance can be issued. (3)

7.3 Determine the value of a resistor with the following colour bands: Violet, Grey, Red and Gold. (5)
**[10]**

**TOTAL: 100**

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# ELECTRICAL TRADE THEORY N1

## FORMULA SHEET

### *RESISTORS*

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

$$R_T = R_1 + R_2 + R_3 + ...$$

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

### *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*

$$C_T = C_1 + C_2 + C_3 + ...$$

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

### *FREQUENCY*

$$f = np$$

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

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