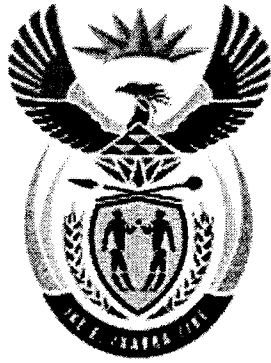


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# higher education & training

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Department:  
Higher Education and Training  
**REPUBLIC OF SOUTH AFRICA**

T510(E)(M27)T  
APRIL 2012

NATIONAL CERTIFICATE

**ELECTRICAL TRADE THEORY N1**

(11041861)

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

**This question paper consists of 6 pages and a 1-page formula sheet.**

**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 correctly according to the numbering system used in this question paper.
  4. ALL diagrams must be neatly drawn and in proportion.
  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 – 1.20) in the ANSWER BOOK.

- 1.1 Water is a conductor of electricity and extreme care should be taken when working with electrical equipment in its vicinity. (1)
- 1.2 Horseplay in a workshop is dangerous and it is the cause of many accidents. (1)
- 1.3 Gas cylinders should not be stored where they could become exposed to excessive heat. (1)
- 1.4 Flame-proofing is required in locations where any electrical appliances are being used. (1)
- 1.5 An electrical installation without a certificate of compliance may not be supplied with power. (1)
- 1.6 A working environment does not necessarily require ventilation and lighting. (1)
- 1.7 Class B fires include those involving solid combustible materials such as paper and plastics. (1)
- 1.8 A conductor is a substance that is capable of preventing the flow of electric current. (1)
- 1.9 Electric current is the movement of neutrons in a specific direction through a material. (1)
- 1.10 Power is the rate of doing work and it is measured in watts. (1)
- 1.11 A voltmeter can be connected only in parallel across an electrical circuit. (1)
- 1.12 The sum of resistances connected in parallel will always be greater than the greatest resistance in the circuit. (1)
- 1.13 The temperature of a conductor has no influence on its resistance. (1)
- 1.14 The most simple contributing factor to the internal resistance of a cell is the type of material used to construct the cell. (1)

- 1.15 The resistance of a substance is directly proportional to its cross-sectional area. (1)
  - 1.16 Permanent magnets appear in the form of lodestone or magnetite. (1)
  - 1.17 Transformers have no moving parts. (1)
  - 1.18 The peak value of a sinusoidal wave represents its minimum value. (1)
  - 1.19 The measurement of the relative density of a cell is carried out by means of a hydrometer. (1)
  - 1.20 When bending a cable, the radius may not be less than that specified by the manufacturer. (1)
- [20]**

**QUESTION 2**

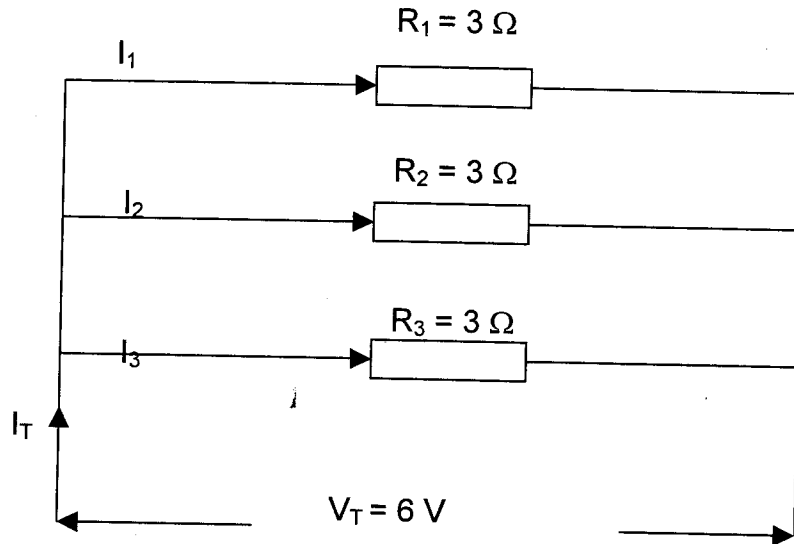
- 2.1 Explain how an electrical circuit can be isolated for inspection, maintenance or repairs. (6)
  - 2.2 When are rubber gloves required to be worn? (2)
  - 2.3 Explain the use and care of a draw tape. (3)
- [11]**

**QUESTION 3**

3.1 Define *Ohm's Law*.

(4)

3.2 The circuit diagram given below shows THREE similar resistors of  $3\ \Omega$  each connected in parallel. A voltage source of  $6\ \text{V}$  is connected across the terminals of the circuit as shown.



Determine the following quantities:

3.2.1 The total resistance of the circuit

(4)

3.2.2 The total current flowing through the circuit

(2)

3.2.3 The total power dissipated through the circuit

(2)

3.2.4 The energy consumed in ONE hour

(4)

[16]

**QUESTION 4**

4.1 Name the electrical quantity represented by each symbol in the given equation below. Also name the standard unit of measurement used for ALL the symbols.

$$E = V + Ir$$

(8)

4.2 Two different batteries have their cells connected in series and parallel respectively. Compare the TWO groups in terms of the EMF, the internal resistance, as well as, the current delivering capacity.

(6)

[14]

**QUESTION 5**

- 5.1 How can the positive and negative terminals of a motor car battery be identified? (4)
  - 5.2 What are the FIVE main components of a lead-acid battery? (5)
- [9]**

**QUESTION 6**

- 6.1 Explain the following terms with reference to a sinusoidal waveform:
    - 6.1.1 Cycle (2)
    - 6.1.2 Average value (2)
  - 6.2 State THREE advantages and THREE disadvantages of a moving coil measuring instrument. (6)
- [10]**

**QUESTION 7**

Make a neat, labelled sketch of a paper insulated lead-covered steel-wire armoured (PILCSWA) cable. [10]

**QUESTION 8**

- 8.1 Describe the construction of a capacitor. (5)
  - 8.2 Three capacitors of values 5  $\mu$ F, 10  $\mu$ F and 20  $\mu$ F are connected in series.  
Determine the total capacitance of the combination. (5)
- [10]**

**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**

$$f = np$$

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