higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

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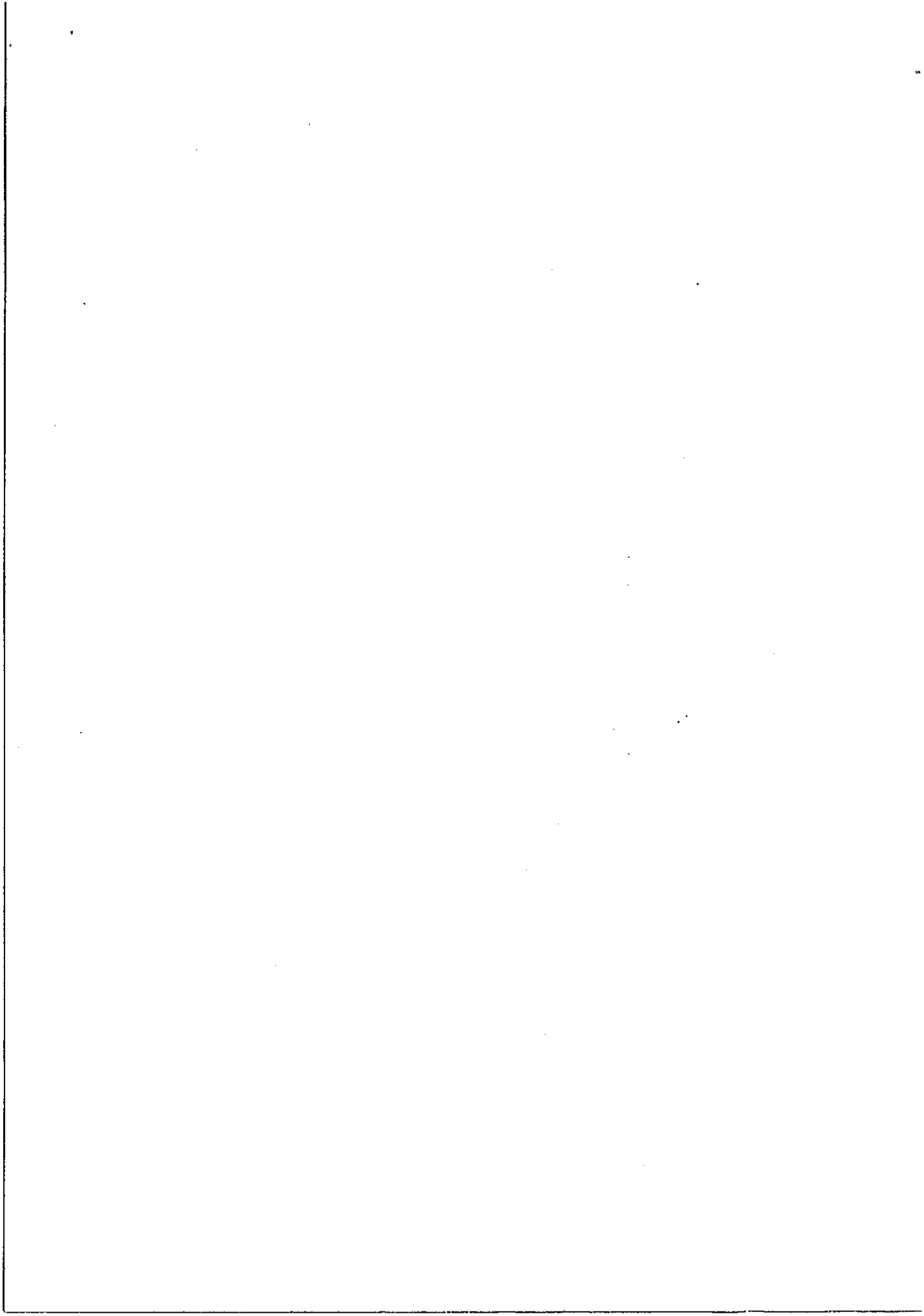
NATIONAL CERTIFICATE

ELECTRICAL TRADE THEORY N1

(11041861)

11 November (X-Paper)
09:00 – 12:00

This question paper consists of 5 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

INSTRUCTIONS AND INFORMATION

1. Answer ALL the questions.
2. Questions relating to the wiring of premises must be answered in accordance with the SABS Code of Practice.
3. Read the questions carefully and answer only what has been asked.
4. Questions may be answered in any order, but subsections of questions must NOT be separated.
5. Rule off on completion of each question.
6. Number the answers correctly according to the numbering system used in this question paper.
7. 1 mark = 1%

QUESTION 1

Indicate whether the following statements are TRUE or FALSE. 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.

1.2 One of the most common causes of electrical shock is improper earthing of equipment.

1.3 There is no danger in carrying out maintenance and repairs on machinery or circuits that are 'live'.

1.4 Resistivity denotes the speed at which an electron can travel.

1.5 A grinding wheel can start to wobble if the hole of the wheel is altered.

1.6 A danger card should be placed on a switch when an appliance is isolated for inspection.

1.7 Hacksaw blades come in different teeth sizes so as to saw different thicknesses of materials.

1.8 The polarity test is done to determine whether the 'live' conductor is connected correctly.

1.9 The 'black' coloured band on a resistor represents a numerical value of five.

1.10 Most conductors are made of copper or aluminium.

1.11 The drift of electrons in a specific direction is known as electrical current flow.

1.12 Electromotive force (EMF) is the electrical pressure that causes current to flow between two points in a circuit.

1.13 The resistance of materials, such as insulators, electrolytes and carbon, decreases with an increase in temperature.

1.14 Alloys used for the resistance wire of elements and standard resistors have very high temperature coefficients of resistance.

1.15 The efficiency of transformers at full load is $\pm$ 97%.

1.16 When a conductor is moved at right angles through a magnetic field an EMF is induced in that conductor.

1.17 In a lead-acid cell the positive and negative plates are separated from each other by means of porous acid resistant separators.

1.18 There are TWO types of moving-iron meters, the attractive and the repulsive types.

PTO

1.19 Silver is not a good conductor of electricity.

1.20 Conductive cable sheath and armouring must be earthed. (20 × 1) **[20]**

QUESTION 2

2.1 What are portable appliances? (2)

2.2 Electrical equipment and circuits should always be adequately protected against faults. Name THREE such protection devices. (3)

2.3 State FOUR safety aspects with regard to fire extinguishers, environmental and preventative practices. (4)

2.4 State any FOUR aspects with regard to the care and use of hand tools. (4)
[13]

QUESTION 3

3.1 Name the symbols used in the following equation:

$Q = I^2 Rt$ (4)

3.2 An electrical lamp generates 3,6 MJ of heat energy in one hour. The filament of the lamp has a resistance of 1 kΩ.

3.2.1 Determine the current flow. (5)
3.2.2 What is the power rating of the lamp? (3)

3.3 TWO resistors of 6 Ω and 3 Ω are connected in parallel. The circuit is supplied from a voltage source of 12 V.

3.3.1 Draw a neat, labelled diagram of the circuit. (3)
3.3.2 Determine the total resistance of the circuit. (3)
3.3.3 Calculate the total current flow. (2)
[20]

QUESTION 4

4.1 State TWO advantages of transformers. (2)

4.2 What are the THREE types of magnets? (3)

4.3 A single-phase step-up transformer has a supply voltage of 220 V and a turns ratio of 1:10. The secondary current is 5 A and the secondary coil is made up of 300 turns.

Calculate the following:

4.3.1	The number of turns on the primary coil	(2)
4.3.2	The primary current	(2)
4.3.3	The secondary voltage	(2)
		[11]

QUESTION 5

Draw a neat diagram of an alternating current (AC) waveform and indicate on it the following features: (4)

5.1	Period time	(1)
5.2	Peak value	(1)
5.3	Peak-to-peak value	(1)
5.4	Instantaneous value	(1)
5.5	Average value	(1)
5.6	Root-mean-square value	(1)
		[10]

QUESTION 6

6.1 Define a *semiconductor* and name TWO examples. (7)

6.2 What does the 'Code of Practice' stipulate with regard to the position of a switch disconnector for a cooking appliance? (5)

6.3 What is the purpose of circuit breakers and fuses? (4)
[16]

QUESTION 7

7.1 What are the stipulations of the 'Code of Practice' when an insulation resistance test is carried out? (5)

7.2 THREE capacitors of 30 μF, 15 μF and 10 μF are connected in series. Determine the total capacitance of the circuit. (5)
[10]

TOTAL: 100

ELECTRICAL TRADE THEORY N1

FORMULA SHEET

RESISTORS

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

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

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

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

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

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

FREQUENCY

$$f = np$$

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