T630(E)(J25)T
AUGUST 2005
NATIONAL CERTIFICATE

ELECTRICAL TRADE THEORY N1
(11041861)
25 July (X-Paper)
09:00 – 12:00

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

DEPARTMENT OF EDUCATION
REPUBLIC OF SOUTH AFRICA
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NATIONAL CERTIFICATE
ELECTRICAL TRADE THEORY N1
TIME: 3 HOURS
MARKS: 100

Answer ALL the questions.

INSTRUCTIONS AND INFORMATION

1. Questions relating to the wiring of premises must be in accordance with the SABS Code of Practice.

2. Candidates will be penalised for untidy and illegible work.

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.

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 A registered installation electrician may issue a certificate of competency.  (1)

1.2 The symbol for double insulation is a square within another square.  (1)

1.3 Green is used to indicate first aid facilities.  (1)

1.4 I = V × R.  (1)

PTO
1.5 The magnetic field of a magnet is located in the space where magnetic attraction takes place.

1.6 The purpose of crimping pliers is to crimp ferrules around a conductor.

1.7 EMF is measured with a load whilst potential difference is measured without a load connected.

1.8 Cells can deliver only a certain amount of current.

1.9 A commutator switches direct current to alternating current.

1.10 An EMF will be generated when a conductor is moved through a magnetic field.

1.11 A combination of a voltmeter and an ammeter can be used to determine the resistance value of a resistor.

1.12 The current in an electrical circuit is directly proportional to the resistance.

1.13 A good conductor must be reasonably cheap.

1.14 There must be no openings on the sides of a conduit.

1.15 Earth means so connected to the general mass of the earth as to ensure immediate discharge at all times.

1.16 A fault current occurs when the insulation of a conductor is damaged.

1.17 An ohmmeter or a buzzer can be used to test for polarity.

1.18 The resistance during an insulation test should not be less than 1 mega-ohm.

1.19 Diodes may not be coupled directly across a supply.

1.20 Resistance values are written on resistors.

QUESTION 2

2.1 Define a flameproof appliance/enclosure.

2.2 Name FOUR accidents typical of poor housekeeping in a workshop.

2.3 Name the THREE elements that are present in all fires.
QUESTION 3

3.1 Name the quantities used in the following equation and give the standard unit for each:

\[ Q = I^2Rt \]  

(8)

3.2 Two resistors of 10 ohms each are connected in parallel. This combination is then connected in series to a resistor of 5 ohms. Power is supplied from a 50-volt source.

Draw a neat, fully labelled diagram of the circuit, then determine the following:

3.2.1 The total resistance of the circuit:  
3.2.2 The total current of the circuit  
3.2.3 The power dissipated in the circuit  
3.2.4 The energy consumed by the circuit in ONE hour

(5)  
(2)  
(2)  
[26]

QUESTION 4

4.1 List the EIGHT factors that must be considered when selecting a cell or battery for a particular application.  

(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 current delivering capacity.

(6)  
[14]

QUESTION 5

5.1 List FOUR means of producing electricity and an example of each.  

(8)

5.2 What are the TWO instrument transformers available?  

(2)  
[10]

QUESTION 6

6.1 State THREE disadvantages of paper insulated cables.  

(3)

6.2 State THREE conditions under which flexible metal conduit shall be used.  

(3)

6.3 What is the purpose of an earth leakage unit?  

(3)  
[9]

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QUESTION 7

7.1 Describe the construction of a capacitor.  

7.2 THREE capacitors of 5 μF, 10 μF and 20 μF are connected in series. Determine the total capacitance of this combination.

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

\[
R = \frac{\rho \times l}{a}
\]

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

TEMPERATURE COEFFICIENT

\[
R_t = R_0 (1 + \alpha t)
\]

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

\[
f = np
\]

\[
f = \frac{1}{T}
\]