higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T500**(E)**(J31)T

NATIONAL CERTIFICATE

ELECTRICAL TRADE THEORY N1

(11041861)

31 July 2018 (X-Paper)
09:00–12:00

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

Copyright reserved

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.

Copyright reserved

QUESTION 1

1.1 What checks should be made when portable appliances are inspected? (4)

1.2 What are the FOUR situations where red is used as the basic colour for colour coding? (4)

1.3 Choose an item or word from COLUMN B that matches a description in COLUMN A. Write only the letter (A–C) next to the question number (1.3.1–1.3.3) in the ANSWER BOOK.

COLUMN A CLASS OF FIRE		COLUMN B FIRE EXTINGUISHER	
1.3.1	Flammable liquids and gases	A	dry powder
1.3.2	Wood, paper, coal, tobacco, grass and other organic material	B	foam
		C	water
1.3.3	Fires occurring in the presence of LIVE electrical installations		

(3 × 2) (6)

[14]

QUESTION 2

2.1 State Joule's law. (5)

2.2 THREE resistors with resistance values of 20 Ω, 30 Ω and 40 Ω respectively are connected in series to a direct-current voltage supply of 60 volt.

Calculate the following:

2.2.1 The total resistance of the circuit. (2)

2.2.2 The total current flowing through the circuit. (2)

2.2.3 The voltage drop across each resistor. (3 × 2) (6)

2.2.4 The total power used by the circuit. (2)

2.3 Explain what would happen with respect to the heat generated by a coil if its resistance decreases and the supply voltage remain constant. (1)

[18]

Copyright reserved

QUESTION 3

3.1 Name TWO ways in which the magnetic flux of a solenoid can be strengthened. (2)

3.2 State TWO main methods of cooling in transformers. (2)

3.3 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 200 turns and on the secondary coil is 50 turns.

Calculate the following:

3.3.1 Turns ratio

3.3.2 The secondary voltage

3.3.3 The secondary current

3.3.4 The KVA available at full load

(4 × 2) (8)

3.4 List THREE types of circuit found in transformers. (3)
[15]

QUESTION 4

4.1 What are used to make electrical connection with the rotating coil in a simple AC alternator? (2)

4.2 With regards to alternating current waveform, what do you by RMS (root mean square) value? (4)

4.3 What is the relative density of a fully charged lead/acid cell? (2)

4.4 What is the function of the commutator in a direct current generator? (2)
[10]

QUESTION 5

5.1 List FOUR main components of a voltmeter or ammeter. (4)

5.2 Explain the purpose of damping in a measuring instrument and name TWO damping methods. (4)

5.3 When should instrument transformers be used? (2)
[10]

Copyright reserved

QUESTION 6

6.1 Name FIVE materials commonly used for electrical insulation. (5)

6.2 Give FOUR advantages of polyvinyl chloride (PVC) as an insulating material. (4)

6.3 What does SANS 10142 stipulate with regard to live and neutral conductors being run in the same wireway? (3)

[12]

QUESTION 7

7.1 Why are the lights in a domestic installation connected in parallel? (2)

7.2 What do you understand by the term earthed? (4)

7.3 Name TWO advantages of overhead lines. (2)

[8]

QUESTION 8

8.1 What instrument is used to carry out an insulation resistance test? (1)

8.2 Which test is carried out after the supply is connected? (2)

8.3 Explain what hazardous situation would arise if the neutral conductor is connected to the centre pin of an Edison-screw type lamp holder. (4)

8.4 Name TWO semiconductor materials. (2)

8.5 THREE capacitors of 9 µF, 12 µF and 10 µF are connected in parallel.

Determine the total capacitance of this parallel connection. (4)

[13]

TOTAL: 100

Copyright reserved

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

$$f = np$$

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

Copyright reserved