



**higher education
& training**

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE
MOTOR ELECTRICAL THEORY N1

(11040601)

13 April 2021 (X-paper)
09:00–12:00

Nonprogrammable calculators and drawing instruments may be used.

This question paper consists of 7 pages.

146Q1A2113

DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA
NATIONAL CERTIFICATE
MOTOR ELECTRICAL 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 may be done in pencil.
 5. Use only a black or blue pen.
 6. Write neatly and legibly.
-

QUESTION 1

1.1 Various options are given as possible answers to the following questions. Choose the answer and write only the letter (A–D) next to the question number (1.1.1–1.1.10) in the ANSWER BOOK.

1.1.1 The electrical circuit responsible for managing the fuel mixture is the ... circuit.

- A auxiliary
- B fuel-injection
- C ignition
- D charging ☒

1.1.2 Electrical pressure is measured in ...

- A amperes.
- B volts.
- C ohms.
- D potential difference.

1.1.3 This material is a conductor of electricity:

- A Bakelite
- B Iron
- C Porcelain
- D Glass

1.1.4 Fleming's right-hand rule applies to ...

- A coils.
- B straight conductors. ☒
- C electric motors.
- D power generators.

1.1.5 The ignition circuit is responsible for ...

- A turning on the ignition lights.
- B igniting the fuel-air mixture.
- C ensuring 12 v at the coil.
- D allowing current consumers to be turned on.

1.1.6 In electronic ignition systems, the primary current is switched on by the ...

- A electronic pulse generator.
- B resistor. ☒
- C transistor.
- D contact breaker points.

1.1.7 The ideal battery electrolyte mixture should be ...

- A 50% water and 50% acid.
- B 30% acid and 70% water.
- C 40% acid and 60% water.
- D 40% water and 60% acid.

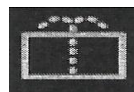


1.1.8 ... globes have the longest life span compared to other globes used for headlights.

- A Halogen
- B Incandescent
- C Xenon
- D LED

1.1.9 The following symbol indicates a faulty alternator:

A



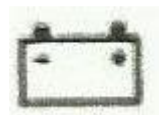
B



C



D



1.1.10 The following symbol represents a fuse in an electrical circuit:

A



B



C



D



1.2 Indicate whether the following statements are TRUE or FALSE by writing only 'True' or 'False' next to the question number (1.2.1–1.2.10) in the ANSWER BOOK.

- 1.2.1 The flow of electricity through a circuit can be compared to water flowing through pipes. ☒
- 1.2.2 EMF is the voltage of the battery when not connected in a circuit.
- 1.2.3 Soft-iron cores in solenoids improve the magnetic flux.
- 1.2.4 An ignition coil is a step-up transformer.
- 1.2.5 Most cars have a positive earth.
- 1.2.6 Maintenance-free batteries do not have to be load-tested to determine their condition.
- 1.2.7 Levelling the headlights means to adjust the lights according to tyre size.
- 1.2.8 The Bourdon tube can also be used in the manufacturing of electronic pressure gauges.
- 1.2.9 The Zener diode allows current to flow even in reverse bias.
- 1.2.10 A transistor consists of three PN junctions. ☒

(10 × 1)

(10)
[20]

QUESTION 2

A circuit consists of three resistors of 5 Ω , 4 Ω and 2 Ω respectively. They are connected in parallel to one another and in series to a battery with an EMF of 12 V and an internal resistance of 0,5 Ω .

- 2.1 Make a neat sketch of the circuit. (3)
- 2.2 Calculate the total resistance in the circuit. (3)
- 2.3 Calculate the total current in the circuit. ☒ (1)
- 2.4 Determine the current flow through each resistor. (8)
- 2.5 Determine the power consumption of the 5-ohm resistor. (1)

[16]

QUESTION 3

- 3.1 Explain the principle of mutual induction. (3)
- 3.2 State the difference between a hot spark plug and a cold spark plug. (2)
- 3.3 Fully explain the operation of the conventional coil-ignition system. (6)
- 3.4 Name SIX components that form part of the conventional coil-ignition system. (6)
- [17]**

QUESTION 4

- 4.1 Explain the function of a relay. (3)
- 4.2 Your brother's old car has a starting problem. The starter only makes a click sound. You recommend the installation of a relay to remedy the problem.
- 4.2.1 Draw a neat, simple wiring diagram to show how a relay should be installed. (6)
- 4.2.2 Explain why this will cure the problem. (3)
- 4.3 What is the function of a fuse in any electrical circuit? (1)
- 4.4 Construct a brake light circuit that only works when the ignition is turned on. Include a main relay and one fuse. (6)
- 4.5 State the most likely reason why direction indicators flash fast. (1)
- [20]**

QUESTION 5

- 5.1 Draw a neat, fully labelled sketch of a vibrating armature hooter. (5)
- 5.2 Explain the operating principle of the vibrating armature hooter. (7)
- 5.3 Give the meaning of each of the warning symbols below. (2)

5.3.1



5.3.2



5.3.3



5.3.4



5.3.5



(5 × 1)

(5)

[17]**QUESTION 6**

6.1 Make TWO labelled sketches to show the difference between NPN and PNP transistors.



(6)

6.2 Make TWO sketches to show how a diode can be connected in forward and reverse bias.

(4)

[10]**TOTAL:****100**