higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE

MOTOR ELECTRICAL THEORY N1

(11040601)

7 April 2020 (X-paper)
09:00–12:00

This question paper consists of 6 pages and 1 formula sheet.

144Q1A2007

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DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE
MOTOR ELECTRICAL THEORY N2
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. Write neatly and legibly.

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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 An pathway conducting electricity is called an electrical …

A field.
B current.
C circuit
D charge.

1.1.2 … is the SI unit for resistance.

A Volt
B Ohm
C Watt
D Ampere

1.1.3 Which ONE of the following circuits maintains the battery voltage in a motor vehicle?

A Engine management circuit
B Charging circuit
C Ignition circuit
D Auxiliary circuit

1.1.4 Component used to turn on the ignition:

A Battery
B Ignition coil
C Ignition distributor
D Ignition switch

1.1.5 Resistor allowing the highest current flow:

A 1 ohm
B 100 ohm
C 10 ohm
D 5 ohm

1.1.6 Insulating material:

A Steel
B Brass
C Copper
D Bakelite

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1.1.7 Component igniting the fuel mixture in a petrol engine:

A Ignition distributor
B Ballast resistor
C Ignition coil
D Spark plug

1.1.8 Voltage of fully charged battery:

A 12 V
B 14 V
C 12,6 V
D 13,2 V

1.1.9 Latest technology in vehicle lighting systems:

A Incandescent
B Halogen
C LED
D Xenon

1.1.10 Additional lights enhancing the headlights with long-range visibility:

A Driving lights
B Auxiliary lights
C Fog lights
D Park lights

(10 × 1)

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 Stop lights indicate that the driver intends to stop.

1.2.2 The fuel gauge indicates how much fuel is left in the tank.

1.2.3 LED globes consume more power than conventional globes.

1.2.4 In most modern cars the intermittent wiper action is not adjustable.

1.2.5 Ammeters measure resistance in an electrical circuit.

1.2.6 All cars are designed to use negative earth.

1.2.7 The transistor can be used as a solid-state amplifier.

1.2.8 Doping is used to influence the electrical characteristics of a material.

1.2.9 In a DC circuit conventional current flows from positive to negative.

1.2.10 Windshield wipers are classified as an electrical accessory.

(10 × 1) (10)
[20]

QUESTION 2

2.1 Three resistors of 5 ohm, 18 ohm and 10 ohm respectively are connected in series to a 12 V battery.

2.1.1 Sketch the circuit and show how voltage can be measured across the 10 ohm resistor. (4)

2.1.2 Calculate the reading for this connection on the voltmeter. (4)

2.1.3 Calculate the current flowing through a 12 V battery. (1)

2.2 Define *Ohm's law.* (2)

2.3 What modification can be done to decrease the current in the circuit in QUESTION 2.1? (2)

2.4 The globe of a headlight is rated at 12V/100W.

2.4.1 Determine the current flowing through this globe.

2.4.2 Calculate the resistance offered by the globe.

(2 × 2) (4)
[17]

QUESTION 3

3.1 Explain how a high-voltage spark is generated in a 12 V ignition coil. (5)

3.2 Which TWO factors determine the exact ignition timing point? *(2)*

3.3 The engine of an old 1975 model car still using contact breaker points is pinking on acceleration.

Explain step by step how the timing must be reset. (8)

3.4 Name the latest development in spark ignition systems. (1)
[16]

QUESTION 4

4.1 A motor car which only starts when a booster battery is used needs a high-rate discharge test.

Explain how this test is done. (5)

4.2 Construct a complete headlight circuit with high and low beams. Include a battery, fuses and relays for both high- and low-beam circuits. No internal detail of relays is required. (8)

4.3 Name the FOUR main external lighting circuits used on motor vehicles. (4)
[17]

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QUESTION 5

5.1 Explain, with the aid of a graph, the operation of the thermistor which controls a temperature gauge. (6)

5.2 Construct a simple oil pressure warning-lamp circuit. Internal details of the pressure switch are not required. (5)

5.3 List FOUR reasons why a hooter may fail. (4)

5.4 Name TWO types of flasher units. (2)
[17]

QUESTION 6

6.1 Define *semi-conductors.* (4)

6.2 Indicate the difference between NPN and PNP transistors with the aid of sketches. (6)

6.3 Name the TWO most common materials used in the manufacture of semi-conductors. (2)

6.4 What does the acronym *LED* mean? (1)
[13]

TOTAL: 100

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MOTOR ELECTRICAL THEORY N1

FORMULA SHEET

1. $I = \frac{V}{R}$ *(A)*

2. $P = I.V(W)$

3. $Rt = R_1 + R_2 + R_3 + \ldots R_n\ (\Omega)$

4. $\frac{1}{R_t} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \ldots \left(\frac{1}{\Omega}\right)$

5. $V = E - I.r\ (V)$

6. $I = \frac{e.m.f}{R_T + r_T}$

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