higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T1180(**E**)(J31)T

NATIONAL CERTIFICATE

MOTOR ELECTRICAL THEORY N1

(11040601)

31 July 2018 (X-Paper)
09:00–12:00

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

Copyright reserved

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. All sketches must be drawn neat and in good proportion.
5. All answers including sketches must be done in the ANSWER BOOK.
6. Write neatly and legibly.

Copyright reserved

QUESTION 1

1.1 Choose the answer and write only the letter (A–D) next to the question number number (1.1–1.10) in the ANSWER BOOK.

1.1.1 Current flow in a conductor can be compared to:

A Magnetic flux in conductors
B Water flowing in a hose pipe
C Water flowing into a dam
D Voltage in an electric circuit

1.1.2 The high-voltage ignition spark is generated in the:

A Ignition coil
B Distributor
C Secondary windings of the coil
D Condenser

1.1.3 Magnetic flux is the:

A Pattern formed by the iron filings in a magnetic experiment
B Magnetic lines formed by a permanent magnet
C Ability of a magnet to attract metals
D Magnetic lines formed around a conductor when current is passed through it

1.1.4 A hydrometer is used to measure:

A Voltage
B Current
C Specific gravity
D Amp-hour rating of the battery

1.1.5 The voltage of a lead-acid cell is:

A 2.1 V
B 2.2 V
C 12 V
D 12.6 V

1.1.6 A battery casing is made of:

A Plastic
B Rubber
C A and B
D A or B

Copyright reserved

1.1.7 This equipment is regarded as an auxiliary equipment on cars:

A Windshield wipers
B Ignition coil
C Starter motor
D Distributor

1.1.8 The component that advances ignition timing according to engine speed is the:

A Rotor
B Mechanical advance unit
C Vacuum advance unit
D Distributor shaft

1.1.9 A 10 A fuse will blow when:

A The current draw exceeds 10 ampéres
B The component it supplies fails
C When the wire size is changed
D When the current draw falls below 5 ampéres

1.1.10 All the warning lights and signals are housed in the :

A Instrument holder
B Warning signal housing
C Instrument cluster
D Speedometer housing

(10 × 1) (10)

1.2 Explain the operation of the moving armature electric fuel pump. (10)
[20]

QUESTION 2

2.1 Three resistors, R = 1 Ω, R2 = Ω and R3 = 4 Ω, are connected in parallel to a battery of 12 V.

2.1.1 Sketch the circuit. (3)

2.1.2 Calculate the total resistance in the circuit. (3)

2.1.3 Calculate the total current in the circuit. (2)

2.1.4 Calculate the current over the 4Ω resistor. (2)

2.2 Explain the operation of the moving coil petrol gauge. (6)

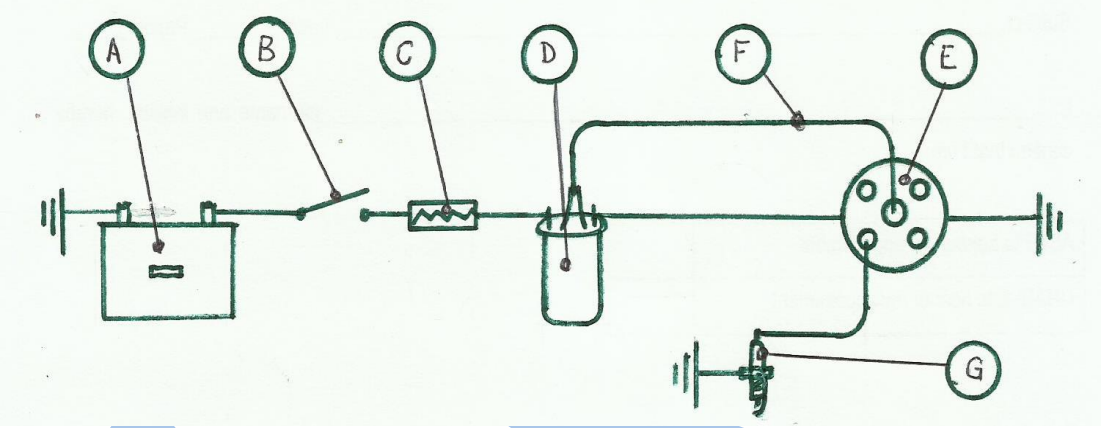
2.3 Construct a hooter circuit to show how a conventional 4-pin relay is connected (show the internal circuit of the relay). (7)
[23]

Copyright reserved

QUESTION 3

3.1 Tabulate the differences between hot and cold spark plugs. (6)

3.2 The diagram below shows a conventional coil-ignition system. Label the parts A to G.



(7)

3.3 Draw the symbol of a Zener diode and label the connections. (3)

3.4 How is a Zener diode connected in a circuit? (1)

3.5 Name the TWO applications of a transistor. (2)

[19]

QUESTION 4

4.1 Fully explain how 'sulphation' occurs in a lead-acid battery. (5)

4.2 What is the mixture ratio of the electrolyte in the lead-acid battery? (1)

4.3 Give the main advantage of the alkaline battery as compared to the lead-acid battery. (1)

4.4 Modern cars are fitted with high-level security, comfort and entertainment systems.

What important precautionary measure must be observed before disconnecting the battery? (2)

4.5 At what level should the electrolyte in a lead-acid battery be kept? (1)

4.6 Explain the construction of a lead-acid cell. (6)

4.7 List FOUR battery maintenance tips. (4)

[20]

Copyright reserved

QUESTION 5

5.1 Write down FOUR types of light bulbs used in headlight construction. (4)

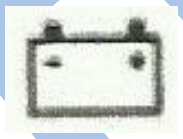
5.2 Name the TWO main constituents of the gas mixture in a halogen bulb. (2)

5.3 High-end modern cars are equipped with adaptive lighting systems.

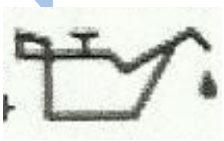
Explain this feature with respect to its operation and advantages. (6)

5.4 Identify the warning symbols 1 to 6.

5.4.1 

5.4.2 

5.4.3 

5.4.4 

5.4.5 

5.4.6 

(6)
[18]

TOTAL: 100

Copyright reserved

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

Copyright reserved