higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T1180(**E**)(A5)T

NATIONAL CERTIFICATE

MOTOR ELECTRICAL THEORY N1

(11040601)

2 April 2018 (X-Paper)
09:00–12:00

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

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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 correctly according to the numbering system used in this question paper.
4 All sketches must be neat and in good proportion.
5 All answers including sketches must be done in the ANSWER BOOK.
6. Write neatly and legibly.

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QUESTION 1

1.1 Indicate whether the following statements are TRUE or FALSE. Choose the answer and write only 'true' or 'false' next to the question number (1.1.1–1.1.10) in the ANSWER BOOK.

1.1.1 An insulator is a material that conducts electricity.

1.1.2 Permanent magnet does not require electric current to be turned into a magnet.

1.1.3 Spark plugs provide the air gap over which the ignition spark can jump.

1.1.4 The battery is the main source of power in the motor car.

1.1.5 LED's are increasing being used in the design of car lighting systems.

1.1.6 An ammeter is used to measure voltage in a closed electric circuit.

1.1.7 The electric clock continues to run, even after the ignition has been turned off.

1.1.8 A solenoid cannot be utilised as an electromagnet.

1.1.9 An analogue voltmeter is more accurate than a digital voltmeter.

1.1.10 To test for current in wires, you can briefly touch them together to see if it sparks. (10 × 1) (10)

1.2 Complete the following sentences by using the words provided in the list below. Write only the word(s) next to the question number (1.2.1– 1.2.5) in the ANSWER BOOK.

single filament; starter motor; windshield wipers; electromagnet; double filament; headlamps; voltage; current

1.2.1 … provide light for night driving.

1.2.2 … is also known as electrical pressure.

1.2.3 A/An… is an accessory that clears the windshield when it rains.

1.2.4 A/An … bulb is normally used in a combination tail and brake light.

1.2.5 A/An … is a magnet that can be turned on or off.

(5 × 1) (5)

[15]

QUESTION 2

2.1 Two light bulbs are connected in series to a 12v battery. I

If one bulb 'fuses', will the remaining bulb continue light up? Substantiate your answer. (3)

2.2 A wiper motor draws a current of 8A from a 12v battery.

Calculate the power consumed if the wipers are switched on for 10 minutes. (3)

2.3 Name THREE common insulators used in car electric circuits. (3)

2.4 THREE 12v batteries are connected in parallel.

2.4.1 Sketch a circuit diagram of this arrangement. (3)

2.4.2 Calculate the total voltage of the circuit. (1)

2.5 Name THREE factors that can influence the resistance in a conductor. (3)
[16]

QUESTION 3

3.1 Make a neat, labelled sketch of an oil filled ignition coil. Show all internal details. (8)

3.2 In a distributor-less ignition system, which electronic component is used to switch the primary circuit? (1)

3.3 Explain the function and operation of the vacuum advance unit. (7)

3.4 Sketch and label a PN junction. (3)
[19]

QUESTION 4

4.1 What is the difference between the EMF and *voltage* of a battery? (2)

4.2 Draw a simple circuit to show haw an ammeter is connected in a circuit. (3)

4.3 State the main difference between a *low-maintenance battery* and a *conventional battery*. (2)

4.4 Make a neat, labelled sketch of a hydrometer. (6)

4.5 Name TWO important tests performed on car batteries. (2)
[15]

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QUESTION 5

5.1 Modern headlamp designs incorporate Xenon lighting.

Explain xenon designs with respect to its construction and operation. (8)

5.2 Sketch a diagram showing the internal circuits of a conventional 4-pin relay. (4)

5.3 Explain the function of the relay in the headlight circuit. (4)

5.4 Sketch a simple reverse light circuit. (5)

[21]

QUESTION 6

6.1 What is the most common reason why a fuse will blow? (1)

6.2 To diagnose a faulty electrical circuit accurately, what important information is needed? (1)

6.3 Explain what is meant by the *magnetic effect of an electric current*. (2)

6.4 How would you test a solenoid or coil? (4)

6.5 Construct a wiring diagram of a park light system. Include two fuses for left and right circuits. (6)

[14]

TOTAL: 100

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FORMULA SHEET

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

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

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

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

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

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

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