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Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE

MOTOR ELECTRICAL THEORY N2

(11040612)

9 April 2020 (X-paper)
09:00–12:00

This question paper consists of 5 pages.

213Q1A2009

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. Sketches must be neat, large and fully labelled.
5. Use only a black or blue pen.
6. Write neatly and legibly.

QUESTION 1

1.1 A motor vehicle has two 24 V batteries connected in series. The combined EMF of both batteries is 48 V. A load drawing 8 amperes is connected to the supply. The internal resistance of the supply is 0,24 Ω.

Calculate the following:

1.1.1 The EMF per battery (2)

1.1.2 The potential difference of the supply at the load (2)

1.1.3 The internal resistance per battery (2)

1.1.4 The internal resistance per cell (2)

1.2 Make a neat sketch of the circuit mentioned in QUESTION 1.1 and indicate on the sketch all the given and calculated values. (4)

1.3 An auto-electrician is responsible for repairing and maintaining the electrical systems in a vehicle.

Name FOUR electrical systems. (4)
[16]

QUESTION 2

2.1 Make a fully labelled sketch and explain how self-induction occurs in a circuit. (7)

2.2 A single conductor of a generator armature is 150 mm long. The conductor moves at right angles through a magnetic field with a flux density of 0,25 tesla at a speed of 70 kilometres per hour.

Calculate the EMF induced in the conductor. (4)

2.3 State THREE practical applications of electromagnetic induction. (3)

2.4 State FOUR advantages of electromagnetic induction. (4)
[18]

QUESTION 3

3.1 Fully describe the construction of a solenoid of a pre-engaged-type starter motor. (3)

3.2 State TWO necessary characteristics of the brush lead of a starter motor. (2)

3.3 State TWO possible causes of burnt windings in a starter motor armature. (2)

3.4 State FOUR components of a starter motor armature. (4)

3.5 Fully describe the construction of the field coils of a starter motor. (4)

3.6 Explain the procedure to test the armature for the following:

3.6.1 Earth fault

3.6.2 Open circuit in windings

3.6.3 Short circuit in windings

(3 × 2) (6)
[21]

QUESTION 4

4.1 Explain the relation between the *points gap,* the *dwell angle* and the *ignition timing* of a vehicle that uses the conventional ignition system. (3)

4.2 State TWO advantages of a *magneto system* when compared to the *conventional ignition system*. (2)

4.3 Make a neat, labelled sketch of a stroboscopic timing light. (4)

4.4 Explain how the breaker point gap of the ignition system is corrected by using a dwell meter. (4)

4.5 State THREE current uses of magnetos. (3)

4.6 State FOUR specifications that are required before setting the ignition timing with timing light. (4)
[20]

QUESTION 5

5.1 Draw a neat, labelled circuit diagram of a full-wave battery charger. Clearly show the alternating input and the direct-current output. (8)

5.2 Explain the procedure to test a lead-acid battery to determine if the cells are sulphated. (4)
[12]

QUESTION 6

6.1 Give ONE reason for a diode short-circuit. (1)

6.2 Name TWO semiconductor materials. (2)

6.3 Give ONE reason for doping semiconductor materials. (2)

6.4 Fully explain the process of doping semiconductor materials. (4)

6.5 Make a neat, labelled sketch showing the forward and reverse characteristics of a silicon diode. (4)

[13]

TOTAL: 100