higher education & training

Department:
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REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE

MOTOR ELECTRICAL THEORY N2

(11040612)

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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. Sketches must be large and neat and may be done in pencil.
5. Use only a black or blue pen.
6. Write neatly and legibly.

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QUESTION 1

1.1 Name FIVE components of a starter motor solenoid. (5)

1.2 Describe the construction of the drive of a pre-engaged-type starter motor. (4)

1.3 Name the type of DC motor that is used for a starter motor and explain why this type of motor is required. (3)

1.4 Make a sketch of the rectangular brush of a starter motor. (2)

1.5 State the function of an armature. (3)

[17]

QUESTION 2

2.1 Choose a description from COLUMN B that matches an item in COLUMN A. Write only the letter (A–J) next to the question number (2.1.1–2.1.10) in the ANSWER BOOK.

COLUMN A		COLUMN B	
2.1.1	Distributor	A	controls spark advance at low engine speed
2.1.2	Static timing	B	produces 10 000 V or more
2.1.3	Low-tension cable	C	produces high voltage when turned
2.1.4	Dwell angle	D	receives and conducts coil output
2.1.5	Ignition coil	E	timing set when engine is operating
2.1.6	High-tension cable	F	used to set gap of ignition points
2.1.7	Dynamic timing	G	conducts current from ignition switch to coil
2.1.8	Vacuum advance unit	H	the duration that the ignition points are closed
2.1.9	Magneto	I	timing set when engine is off
2.1.10	Dwell meter	J	conducts voltage from coil to distributor

(10 × 1) (10)

2.2 Mutual induction is the production of electricity between two coils.

Make TWO sketches and explain how electricity is produced by mutual induction. (2 × 4) (8)

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2.3 Explain Fleming's left-hand rule. (4)

2.4 Explain the electrical principle of polarity and give ONE example where polarity is used in a motor. (2)

2.5 Explain the difference between a motor and a generator. (2 × 2) (4)

[28]

QUESTION 3

3.1 The following component is a part of a starter motor.



3.1.1 Name the component.

3.1.2 State the function of the component.

3.1.3 Name the insulating material that is found between the windings and the core.

3.1.4 Name the component (not shown) that keeps the armature in a centralised linear position.

(4 × 2) (8)

3.2 Explain the purpose of the overrunning clutch that is found in the drive of the pre-engaged-type starter motor (4)

3.3 Describe the construction of the field coils of a starter motor. (4)

3.4 Fully describe the operation of a screw push-type starter motor, that is, how the pinion engages and turns the ring gear attached to the engine of a vehicle. (6)

[22]

QUESTION 4

4.1 A defective transistor will cause a malfunction with the electronic device that the transistor is fitted to.

Explain fully the procedure that is used to test a NPN transistor for the correct operation. (4)

4.2 Give ONE reason why a diode short–circuit would occur. (1)

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4.3 Give ONE reason why a transistor produces better quality switching than a contact breaker switch (2)

4.4 Name the instrument that is used to test a diode and explain the procedure that is used. (4)

4.5 Name THREE types of transistors and name the use of each transistor. (3 × 2) (6)

[17]

QUESTION 5

5.1 Make a neat, labelled sketch of a motor generator charging system that is used by large transport companies. (5)

5.2 State the purpose of the rectifier in a battery charger. (2)

5.3 State the respective polarities that are required at the collector, base and emitter of a PNP transistor that is used to conduct as a switch. (3)

[10]

QUESTION 6

6.1 State TWO responsibilities of an auto electrician.

6.2 State TWO uses of a transistor.

6.3 Explain the purpose of the test instrument called a growler.

(3 × 2) **[6]**

TOTAL: 100

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