higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

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NATIONAL CERTIFICATE

MOTOR ELECTRICAL THEORY N2

(11040612)

8 April 2019 (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 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

Two resistors of 15 ohms and 4 ohms respectively are connected in parallel. This combination is then connected in series to a resistor with an unknown value. The potential difference across the complete circuit is 4 volts.

Calculate the:

1.1 Value of the parallel resistors (2)

1.2 Value of the unknown resistor when a total current of 0,5 amperes flows through the circuit (4)

1.3 Voltage across the parallel resistors (2)

1.4 Current flowing through the 4-ohm resistor (2)

[10]

QUESTION 2

2.1 Briefly explain each of the following:

2.1.1 The torque of a motor (3)

2.1.2 The potential difference of a circuit (3)

2.1.3 The resistance of a circuit (4)

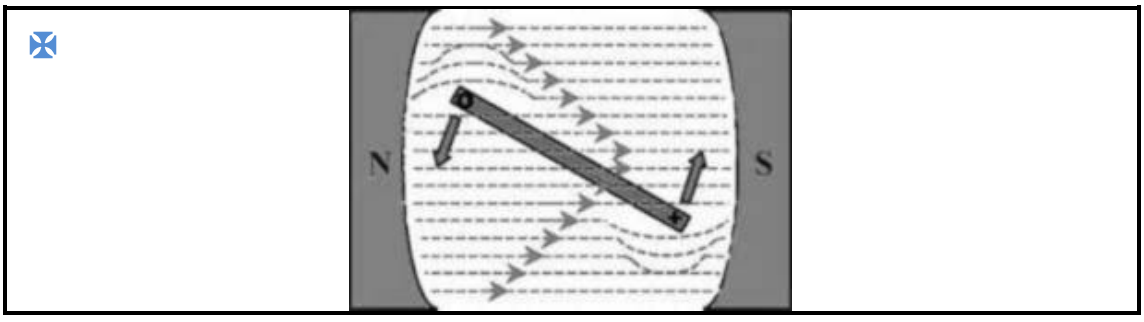
2.2 An auto-electrician is responsible for repairing and maintaining the electrical systems in a vehicle.

Name FOUR electrical systems. (4)

[14]

QUESTION 3

3.1 The diagram below shows a single conductor moving within a magnetic field.



Use the principle of electromagnetic induction to explain the generation of EMF within the conductor. Start with the two angles at which the maximum EMF is produced. (6)

3.2 Give TWO possible causes of burnt windings in a starter motor. (2)

3.3 A conductor is 800 mm long and moves at right angles through a magnetic field with a density of 0,3 tesla.

Calculate the velocity of the moving conductor if the EMF generated by the conductor is 1,1 V. (5)

3.4 Give TWO examples of electrical equipment in a motor vehicle that uses electromagnetic coils. (2)
[15]

QUESTION 4

4.1 Briefly explain how to test each of the following coils of a starter solenoid:

4.1.1 Hold-in coil

4.1.2 Pull-in coil

(2 × 4) (8)

4.2 Explain the procedure to test a lead-acid battery for sulphated conditions. (4)

4.3 Explain the purpose of the smoothing capacitor used in rectifier circuits. (2)

4.4 Name FOUR components of a solenoid used in a pre-engaged type starter motor. (4)
[18]

QUESTION 5

5.1 Explain the operation of a screw push-starter motor – specifically how the pinion engages and turns the ring gear attached to the engine of a motor vehicle. (6)

5.2 Assume that a certain fault in the starting system caused the starter-motor drive to remain locked with the ring gears.

If the ratio of the starter-motor drive to the ring gear is 1:10, calculate the starter armature speed while the drive is locked in the ring gear at an engine speed of 1 000 r/min. (3)

5.3 Explain step by step how to set the dynamic ignition timing of an engine by using a stroboscopic timing light. (3)

5.4 Describe the construction of a starter-motor armature. (7)
[19]

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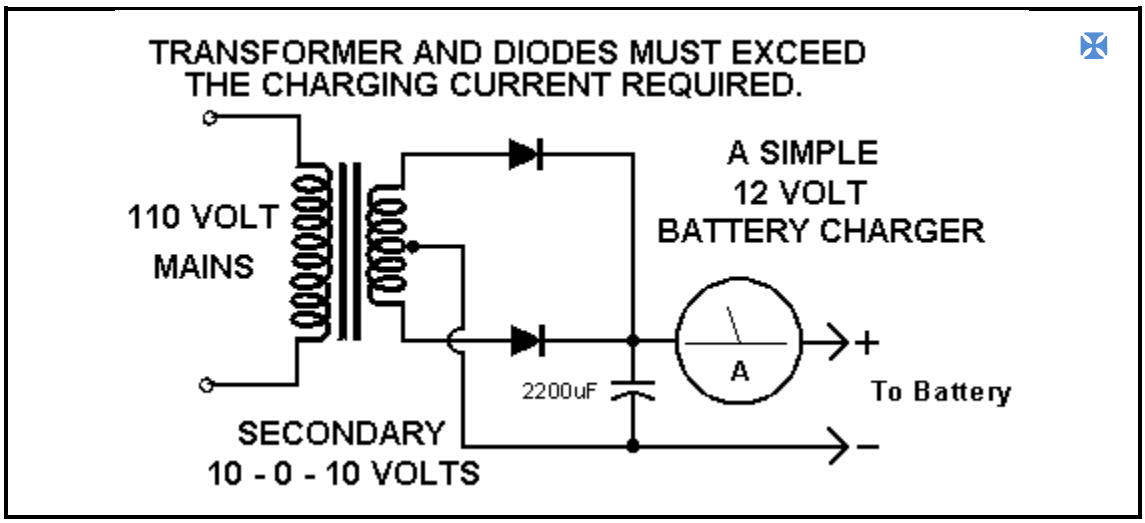
QUESTION 6

6.1 Explain in detail the procedure used to test an NPN transistor using a multimeter. (4)

6.2 Explain the purpose of a diode in a circuit. (2)

6.3 The diagram below shows a simple 12-volt battery charger.



State the type of rectifier used: full-wave or half-wave. (2)

6.4 Refer to the diagram in QUESTION 6.3 and answer the following questions:

6.4.1 State the type of transformer used. (2)

6.4.2 Explain the purpose of the transformer. (2)

6.4.3 Explain the process that produces the DC output. (3 × 2) (6)

6.5 Name THREE types of transistor amplifiers. (3)

6.6 Give a use of each type of transistor named in QUESTION 6.5. (3)

[24]

TOTAL: 100

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(11040612)

FORMULA SHEET

$R_t = R_1 + R_2 + ……..R_n$

$$\frac{1}{Rt} = \frac{1}{R1} + \frac{1}{R2} + ……R_n$$

$$I = \frac{V}{R}$$

$$I = \frac{E}{R+r}$$

$P = VI$

$P = I^2R$

$V = E + Ir$

$E = blvSin\theta$

$F = bli$

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