higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

MOTOR ELECTRICAL THEORY N2

24 November 2022

This marking guideline consists of 5 pages.

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QUESTION 1

1.1 H ✓
1.2 F ✓
1.3 J ✓
1.4 A ✓
1.5 D ✓
1.6 B ✓
1.7 I ✓
1.8 G ✓
1.9 E ✓
1.10 C ✓

(10 × 1) **[10]**

QUESTION 2

2.1 2.1.1

$$R_P = \frac{60 \times 20}{60 + 20} \checkmark$$
$$= 15\ \Omega \checkmark\checkmark$$

2.1.2

$$R_T = 15 + 25 \checkmark$$
$$= 40\ \Omega \checkmark\checkmark$$

2.1.3

$$I = \frac{20}{40} \checkmark$$
$$= 0{,}5\ A \checkmark\checkmark$$

2.1.4

$$V_{R3} = 0{,}5 \times 15 \checkmark$$
$$= 7{,}5\ V \checkmark\checkmark$$

2.1.5

$$I_{R2} = \frac{7{,}5}{60} \checkmark$$
$$= 0{,}125\ A \checkmark\checkmark$$

2.1.6

$$P_{R2} = 00{,}125^2 \times 60 \checkmark$$
$$= 0{,}937\ V \checkmark\checkmark$$

(6 × 3) (18)

2.2

$$R_t = \frac{28 - 24}{20} \checkmark$$
$$= 0{,}2\ \Omega \checkmark$$

$$r/cell = \frac{0{,}2}{12} \checkmark$$
$$= 0{,}017\ \Omega \checkmark$$

(4)
[22]

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QUESTION 3

3.1 3.1.1 Armature ✓ (1)

3.1.2 It produces a directional magnetic field when connected to a supply, ✓ causing it to rotate. ✓ (2)

3.1.3 Mica compound✓✓ (2)

3.1.4 Two bushes ✓✓ (2)

3.2
- When the start switch is closed, ✓
- the coils in the solenoid are energised, ✓
- creating a magnetic field. ✓
- The field pulls the plunger inward, ✓
- which causes the shift lever to push the drive assembly into mesh ✓
- with the ring gear on the engine flywheel. ✓ Any similar description (6)

3.3



(3 x 1) (3)

3.4 Continuously operating the starter motor:
- fitted to an engine that fails to start due to a fault. ✓
- connected to an engine that turns too slowly after being rebuilt. ✓
- Due to a faulty Bendix not disengaging from the engine causing the motor to overrun. ✓ Any relevant answer (2)

3.5
- The overrunning clutch disengages the drive from the armature in the event of reversal of rotation of the engine ✓
- while the engine is connected to the drive during starting. ✓ (2)

3.6
- The field coils are constructed of rectangular coils of thick flat copper conductors. ✓
- The conductors are separated with paper insulation. ✓
- The coils are insulated with plastic or cloth. ✓
- Varnish is applied to the coils to strengthen the coils. ✓ (4)

[24]

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QUESTION 4

4.1
- Disconnect the vacuum advance hose. ✓
- Loosen the distributor bolt. ✓
- Connect the timing light's leads to the battery and the respective inductive lead. ✓
- Operate the engine to specifications. ✓
- Align the timing mark to the flashing light by turning the distributor. ✓
- Tighten the distributor and connect the vacuum hose. ✓
- Recheck the vacuum advance and centrifugal timing settings. ✓

(Any similar 6 × 1) (6)

4.2
- Ensure the vehicle is unable to move. ✓
- Ensure the vehicle is in neutral. ✓
- Keep hands at a safe distance from moving parts. ✓
- Do not wear loose clothing or jewellery. ✓
- Take care as engine must be on working temperature. ✓
- Keep hand away from condenser as it will cause electrical shock. ✓

Any relevant answer (4)

4.3 The magneto has a stationary permanent magnet with a strong magnetic field fitted inside a cylindrical frame. ✓Within the frame is an armature with many conductors. ✓The rotating armature conductors cut the magnetic field of the magnet ✓thus producing a high-output voltage within the armature ✓that is transferred to the output leads. ✓ (5)

4.4 The CPU of the electronic ignition system is designed to automatically alter the timing settings✓ under different load and air density conditions. ✓ (2)

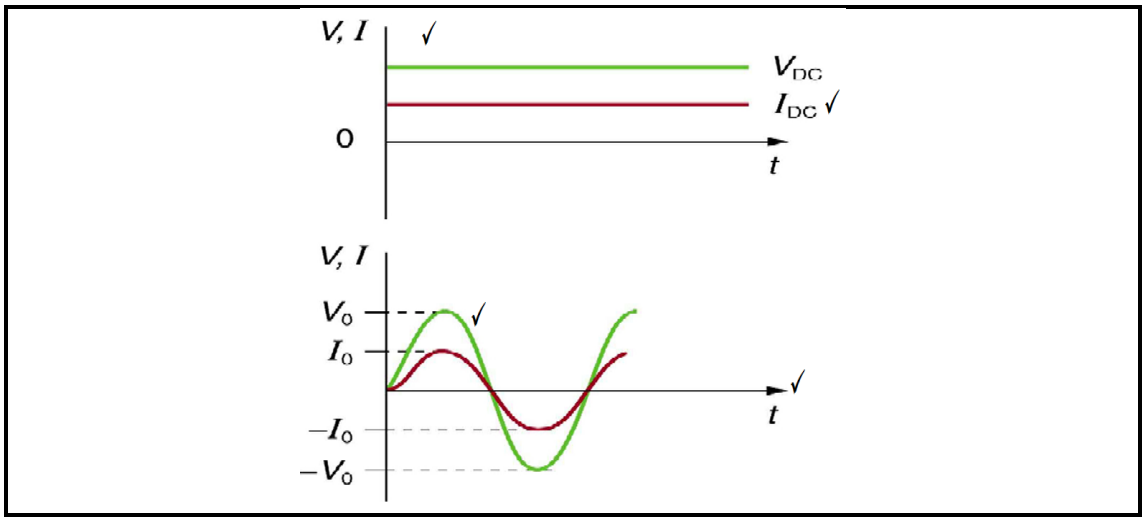
4.5
- Primary coil ✓
- Secondary coil ✓
- Tower ✓
- Housing ✓
- Connecting terminals ✓

(Any 4 × 1) (4)
[21]

QUESTION 5

5.1 For a pulsating DC output at maximum voltage ✓ the capacitor charges fully.✓As the voltage falls the capacitor discharges through the load, ✓ producing a smoothened output ripple. ✓ (4)

5.2



. (2 × 2) (4)

5.3
- Electrolyte levels ✓
- SG of the electrolyte ✓
- Voltage of the battery ✓

Any other relevant checks (3)

5.4
- Voltmeter ✓
- Hydrometer ✓

Any other relevant (2)

5.5
- Charge the battery at 8 amps ✓
- Charge over an estimated time of 6–8 hours ✓
- Monitor the temperature every 15 min ✓
- Top-up electrolyte as needed ✓ (4)

5.6
- Ensure that all the precautions and safety requirements for the vehicles are strictly observed. Must be blocked, in neutral and all accessories off.✓
- The two vehicles must not touch each other. ✓
- Connect jumper leads correctly without causing sparks or shot circuit. ✓
- Start car B first. ✓
- Run car B's engine at 2 000 r/min for a view minutes before starting A. ✓
- Do not attempt to repeatedly start vehicle A if it fails to start. ✓ (6)

[23]

TOTAL: 100

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