higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

MOTOR ELECTRICAL THEORY N2

1 December 2023

This marking guideline consists of 5 pages.

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QUESTION 1

1.1 1.1.1 emf = 1,2 × 6 = 7,2 V✓✓

1.1.2 $I = \frac{V}{Rt}$

$= \frac{7,2}{11,2}$

= 0,643 A✓

$Rt = Ir + R$

= 1,2 + 10

= 11,2 Ω✓

1.1.3 Pd = I × R

= 0,643 × 10✓

= 6,43 V✓

1.1.4 P = V × I

= 7,2 × 0,643

= 4,63 W✓✓

(4 × 2) (8)

1.2 1.2.1 $\frac{1}{Rt} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$

$= \frac{1}{6} + \frac{1}{8} + \frac{1}{12}$

$= \frac{4 + 3 + 2}{24}$

$= \frac{9}{24}$

$Rt = \frac{24}{9}$

= 2,667 Ω✓✓ (2)

1.2.2 $I = \frac{V}{R}$

$= \frac{48}{2,667}$

= 17,998 A✓✓ (2)

1.2.3 $I_1 = \frac{V}{R}$ $I_2 = \frac{V}{R}$ $I_3 = \frac{V}{R}$

$= \frac{48}{6}$ $= \frac{48}{8}$ $= \frac{48}{12}$

= 8 A✓✓ = 6 A✓✓ = 4 A✓✓ (6)

1.3 1.3.1 Electromotive force is the electric tension measured across the poles of a battery when the circuit is open.

1.3.2 Potential difference is the electric tension measured across the poles of a battery when the circuit is closed.

(2 × 2) (4)

[22]

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QUESTION 2

2.1
- Off-load current draw
- On-load current draw
- Off-load voltage
- On-load voltage
- Off-load torque
- On-load torque
- Off-load speed
- On-load speed (Any 4 × 1) (4)

2.2 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.✓ (3)

2.3
- Good flexibility
- High strength
- Ability to conduct high current
- Ability to conduct temperature (4)

2.4
- The brushes transfer high current to the commutator segments.✓
- The materials used are copper✓ and carbon.✓ (3)

2.5 Series type✓ as it uses a large current to produce the required torque and speed✓ (2)
[16]

QUESTION 3

3.1
- Disconnect the vacuum advance hose.
- Loosen the distributor bolt.
- Connect leads to the battery and respective lead.
- Operate the engine to specification.
- Align the timing mark to flashing light by turning the distributor.
- Tighten the distributor and connect the vacuum hose.
- Recheck the vacuum advance and centrifugal timing settings. (Any 5 × 1) (5)

3.2
- Primary coil
- Secondary coil
- Tower
- Housing
- Connecting terminals (Any 4 × 1) (4)

3.3 3.3.1 Timing set when the engine is off

3.3.2 Timing set when the engine is running

3.3.3 Duration that the ignition points are closed

(3 × 2) (6)

3.4 The primary of the ignition coil can be checked for an open circuit by connecting an ohmmeter across the two primary terminals.✓ An infinite reading indicates an open circuit.✓ The secondary of the ignition coil can be checked by connecting the ohmmeter from the high-tension centre tower to either primary terminal. An infinite reading indicates an open circuit.✓ The test instrument that can be used is an ohmmeter✓ or test light.✓ (5)

[20]

QUESTION 4

4.1 4.1.1 Connect the ohmmeter lead on the metal core and the other lead on the segments of the commutator. The resistance for no earth fault should be infinite.

4.1.2 Connect the ohmmeter lead to one commutator segment. Connect the other lead to each individual segment. At each segment a low resistance indicates no open circuit.

4.1.3 Place the armature core on the pedestal of the growler. Switch on the growler and hold a thin metal strip above the core. Rotate the armature. If the metal strip is attracted to the core, then there is a short between the windings.

(3 × 3) (9)

4.2
- Series wound
- Shunt wound
- Compound wound (3)

4.3
- To transfer output current to the system
- To convert alternating current to direct current (2)

4.4
- Cells
- Battery
- DC generator (Any 2 × 1) (2)

[16]

QUESTION 5

5.1 To change alternating current to direct current (2)

5.2 Use a hydrometer to test the SG-levels of each cell. Note the initial battery voltage. Charge the battery at 30 A for three minutes. Note the voltage. If the voltage is four or more volts above the initial reading, then the battery is suspected to be sulphated. (4)

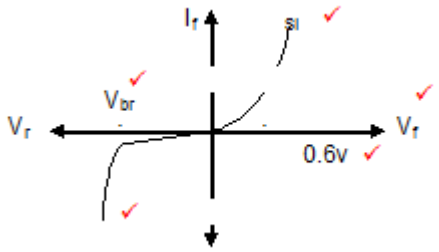
5.3 Check the electrolyte level. Charge at approximately 20 A for a period not exceeding one hour. Monitor the procedure every 10 minutes. Ensure the battery does not overcharge and overheat. (4)

5.4
- Charging current too low
- Battery not serviced and charged when not being used
- Topping up cells with nonpurified water (3)

[13]

QUESTION 6

6.1



(5)

6.2 6.2.1 0,6 V
6.2.2 0,2 V

(2 × 2) (4)

6.3 To step up or step down the voltage in a circuit (2)

6.4 To conduct current in the forward direction and block reverse current (2)

[13]

TOTAL: 100

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