higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE (VOCATIONAL)

ELECTROTECHNOLOGY
NQF LEVEL 3

18 February 2025

This marking guideline consists of 6 pages.

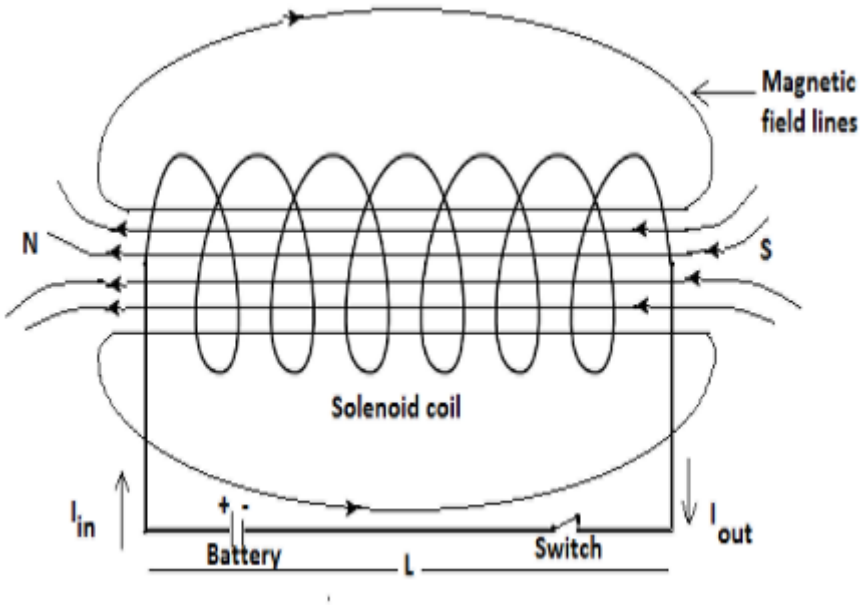
Copyright reserved

QUESTION 1

1.1 1.1.1 B✓
1.1.2 A✓
1.1.3 A✓
1.1.4 B✓
1.1.5 A✓

(5 × 1) (5)

1.2



1 mark for the solenoid coil
1 mark for the supply/battery
1 mark for the magnetic field lines
1 mark for the bar magnet with poles (south to north)
2 marks for the correct diagram (6)

1.3
- Increase in the current flow✓
- Placing an iron core inside the solenoid (coil)✓
- Increase in the number of turns of the coil✓ (3)

1.4 Carbon✓ (1)

1.5 1.5.1 $P_{out} = V \times I$
$= 250 \times 100$
$= 25\,000$ W
$= 25$ kW (2)

1.5.2 $P_{in} = P_{out} + P_{loss}$
$P_{loss} = P_{in} - P_{out}$
$= 30\,000 - 25\,000$
$= 5\,000$ W
$= 5$ kW (1)

1.5.3 $$\eta = \frac{P_o}{P_i} \times 100\%$$

$$\eta = \frac{25\,000}{30\,000} \times 100\%$$

$$\eta = 83{,}333\%$$ (2)

[20]

QUESTION 2

2.1
2.1.1 True✓
2.1.2 True✓
2.1.3 False✓
2.1.4 True✓
2.1.5 True✓

(5 × 1) (5)

2.2 Earthing prevents people and animals from danger or getting shocked by taking unwanted current to the ground.✓✓ (2)

2.3 Test the continuity of each winding by putting the leads of the tester at the ends of each winding.✓✓ (2)

2.4
- Manual control✓ requires that the operator be present to turn the system on or off and perform any other change in the status of the machine.✓ Manual control is normally achieved by means of simple devices connected directly between the motor and the line.✓
- Semi-automatic control✓ is characterised by the use of push buttons, limit switches, pressure switches, float switches and other switching devices to control the operation of starters or contactors.✓ The starter/contactor coil is controlled by pilot devices and sensors to connect the motor to the line voltage. The operator is still required to initiate the starting and stopping of the electric motor from a remote position.✓
- Automatic control✓ is similar to semi-automatic control in that pilot and sensing devices are employed to link the motor with the line voltage via contactor contacts.✓ This system does not require the operator to initiate any action once the machine/system has been turned on as its design operation is controlled by means of a hard or soft control program using feedback-sensing devices. ✓

(3 × 3) (9)

2.5 1 mm^2 or 1,5 mm^2✓✓ (2)

[20]

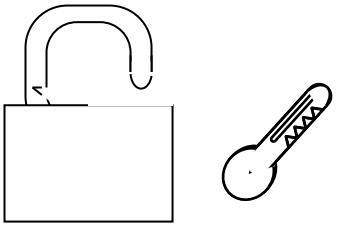
QUESTION 3

3.1 3.1.1 E✓
3.1.2 F✓
3.1.3 D✓
3.1.4 B✓
3.1.5 C✓

(5 × 1) (5)

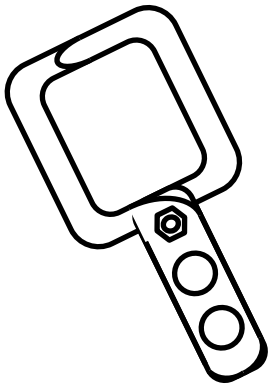
3.2 3.2.1

- Padlock and key when only one person is working on the system



A padlock and key

- A lockout hasp if more than one person is working on the system at the same time



(2 + 2) (4)

3.2.2 A lockout tag should indicate by whom and when the equipment was locked out. Information such as contact details may also be included.✓ Tags should be durable and securely fastened to the locked-out equipment to prevent accidental removal and should remain legible in all weather conditions.✓ Tags should only be applied and removed by the respective authorised individual. Lockout tags warn of danger and no one should tamper with the equipment to which they are attached.✓ (3)

3.3 **Circuit diagram**

This shows how the electrical components are connected and used:

- Symbols to represent the components✓
- Lines to represent the functional conductors✓
- Wires connected together✓
- The supply is represented by positive or negative for DC supply and AC is indicated by live and neutral.✓

Wiring diagram

This shows all the wiring between the parts:

- Control or signal functions✓
- Power supplies and earth connections✓
- Termination of unused leads and contacts✓
- Interconnection via terminal posts, blocks, plugs, sockets and lead-through✓ (4 + 4) (8)

3.4



(3)

3.5

- Diagonal cutter✓
- Wire stripper✓
- Combination pliers✓
- Long nose pliers
- Screwdrivers (Phillips and flat)✓
- Hacksaw✓
- Utility knife✓
- Measuring tape✓
- Centre punch
- Scriber
- Set of tube spanners
- Crimping tool (Any 7 × 1) (7)

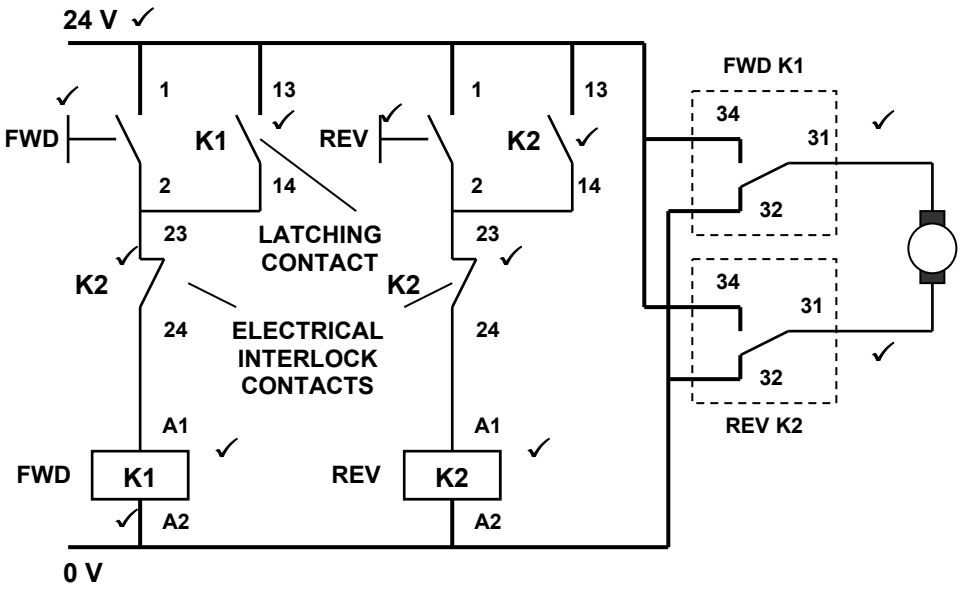
[30]

QUESTION 4

4.1 4.1.1 Ladder logic diagram (ladder diagram)✓
4.1.2 Rails✓
4.1.3 Rung✓
4.1.4 Relay coil✓
4.1.5 Contacts✓

(5 × 1) (5)

4.2



(12)

4.3 Relay logic diagrams are created to show the logical relationship between devices. Relay logic diagrams are sometimes called 'elementary diagrams', 'line diagrams' or 'relay ladder logic (RLL)'. We use the term 'relay logic diagram' that must not be confused with a PLC ladder diagram.✓ Relay logic diagrams are very important because they show the symbols for different input and output devices.✓ These input and output devices are in the American ladder format.✓ (3)

[20]

QUESTION 5

5.1 It is important to calibrate testing equipment to ensure correct adjustment to for optimal operation.✓ It ensures they fall within specifications to improve the accuracy of the device✓ and ensures consistent measurements in testing applications.✓ (3)

5.2
- Poor time management✓
- Poor commissioning planning resulting in possible future unnecessary breakdowns✓
- Poor construction planning leading to a range of issues including delays and disruptions, cost overruns and even safety hazards✓ (3)

5.3 A well-planned and executed maintenance schedule is essential to the satisfactory operation of electronic and electrical equipment.✓✓ It helps organisations meet production schedules, minimise costly downtime and lower the risk of workplace accidents and injuries.✓✓ (4)

[10]

TOTAL: 100

Copyright reserved