higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE (VOCATIONAL)

ELECTRICAL WORKMANSHIP
NQF LEVEL 4

XX February 2020

This marking guideline consists of 6 pages.

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QUESTION 1

1.1
- An arcing fault caused by equipment failure
- Human error - improper placement of tools or improper use of equipment
- Conduction of electricity due to foreign particles in the air (3)

1.2
- Fires
- Burns (Any 1 × 1) (1)

1.3
- Safety hazards
- Health hazards (2)

1.4
- At the point of operation✓ where the work is performed on the material, e.g. where the blade cuts the material.✓
- The power transmission components✓ that transmit energy to the part of the machine performing the work, e.g. pulleys, belts, couplings, cams, gears and chains.✓
- Other moving parts✓ that move while the machine is working, including rotating and transverse moving parts, as well as feeder mechanisms and auxiliary parts of the machine.✓ (3 × 2) (6)

1.5
- Falling objects
- Flying objects
- Abrasive objects
- Splashing objects
- Harmful dusts
- Fumes
- Vapours
- Gases (Any 4 × 1) (4)

1.6
- Managers
- Supervisors (2)

1.7
- The main aim is to eliminate hazards
- and if it is not possible, then the risks associated with the hazards must be minimised. (2)

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QUESTION 2

2.1
- Circuit/schematic diagrams
- Wiring diagrams
- Block diagrams/line (box) diagrams
- Layout diagrams
- Ladder diagrams (Any 4 × 1) (4)

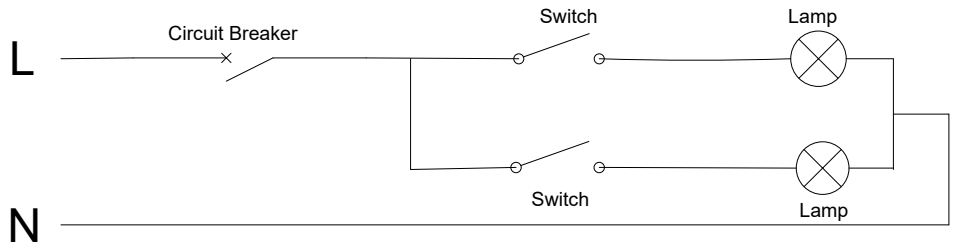
2.2 2.2.1 V_{drop} = 5% of V_{supply}

= 5/100 × 230✓

= 11,5 V✓ (2)

2.2.2 230 – 11,5 = 218,5 V (1)

2.3 2.3.1



1 mark for circuit breaker correctly connected
1 mark each for two parallel connected branches with switch and lamp if correctly connected
2 marks for any labels (5)

2.3.2 10 A

2.3.3 1,5 mm^2

(2 × 1) (2)

2.4
- Damage to insulation, as heat produced due to the short circuit can increase and eventually start melting the insulation
- Conductors can weld together when heat is produced due to a short circuit
- Possibility of fire, as heat is produced when a short circuit occurs and sparks produced can cause a fire or an explosion
- Deformation of busbar conductors due to excessive heat which can cause the busbar to buckle
- The stability of the power system can be affected, possibly even leading to a complete shutdown
- Damage can be caused to other equipment in the system (6 × 1) (6)

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QUESTION 3

3.1
3.1.1 Candela (cd)
3.1.2 Illuminance
3.1.3 E
3.1.4 Lumens per watt (lm/W)
3.1.5 k
3.1.6 Luminance
3.1.7 Candelas per square centimetre (cd/cm^2)
3.1.8 F

(8 × 1) (8)

3.2
- Filament lamps:✓ In these lamps a filament is made incandescent by the passage of electric current.✓
- Arc lamps:✓ In these electric lamps the light is emitted by an arc.✓
- Discharge lamps:✓ In these lamps light (or radiant energy at wavelength near that of the visible spectrum) is produced by the passage of an electric current through a vapour or gas.✓ (3 × 2) (6)

3.3
3.3.1 Reflector lamp

3.3.2 Pressed glass aluminised reflector

3.3.3
- Outdoor usage
- Spotlights in display windows (Any 1 × 1)

(3 × 1) (3)

3.4
- Currently higher priced per lumen
- The performance depends on the ambient temperature of the operating environment
- Must be supplied with the correct current (3)

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QUESTION 4

4.1 4.1.1 Check for:

- Continuity test (Open windings, Shorted windings)
- Insulation resistance test
- Worn carbon brushes (3)

4.1.2

- Continuity test (Open windings, Shorted windings) may result in a totally dead motor✓, fuse or circuit breaker may trip/ excessive current.✓
- Insulation resistance test may result in excessive current,✓ severe sparking, reduced speed and power and overheating or the thermal protector, fuse or circuit breaker may trip.✓
- Worn carbon brushes may result in erratic or sluggish operation,✓ excessive sparking or damage to the commutator.✓ (3 × 2) (6)

4.1.3 Clean the old or contaminated lubricant off the gears✓ and apply new lubricant.✓ (2)

4.2 4.2.1 Bimetal strip stuck together
4.2.2 Check bimetal strip and replace if necessary
4.2.3 Element's retaining screws are loose
4.2.4 Tighten the screws
4.2.5 Lipped seal perished
4.2.6 Replace the lipped seal
(6 × 1) (6)

4.3

- Know what the appliance or power tool is used for.
- Know where the appliance or power tool is used.
- Know how the appliance or power tool works. (3)

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QUESTION 5

5.1 5.1.1
- Series resistance or applied voltage control
- Tapped field method
- Centrifugal switch method (3)

5.1.2
- Series resistance or applied voltage control: in a sewing machine operated with a foot pedal
- Tapped field method: in a domestic food mixer or fan
- Centrifugal switch method: can also be used in some types of food mixers (3 × 1) (3)

5.2 5.2.1
- The type of motor/machine
- The conditions or environment in which the motor/machine operates
- The age of the motor/machine
- The history of the motor/machine
- The recommendations of the manufacturer (5)

5.2.2
- Periodic inspections
- Tests
- Planned minor repairs
- Well-documented record of actual work done (4)

5.3 5.3.1
- Elevators
- Conveyors (2)

5.3.2
- Pumps
- Lathes
- Fans
- Printing presses
- Woodworking machines
- Vacuum cleaners
- Hairdryers
- Sewing machines
- Food mixers/processors (Any 3 × 1) (3)

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TOTAL: 100

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