higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE (VOCATIONAL)

ELECTRICAL SYSTEMS AND CONSTRUCTION
NQF LEVEL 4

11 March 2020

This marking guideline consists of 6 pages.

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QUESTION 1

1.1 It is the maximum temperature✓ at which the transformer can safely operate without failing.✓ (2)

1.2
- Radial network
- Ring-feed or interconnected network (2)

1.3 1.3.1 Removes particles from a flowing gas, such as air, dust and smoke✓ using an induced electrostatic charge✓

1.3.2 Condenses exhaust steam✓ from the steam turbine into water✓

1.3.3 Releases exhaust fumes✓ from burning coal into the environment✓

(2 × 3) (6)

1.4 1.4.1 Medium voltage
1.4.2 High voltage

(1 × 2) (2)

1.5
- Stray insulators
- Composite stray insulators
- Pin insulators
- Strain insulators
- Suspension insulators
- Composite tension insulators
- Glass tension insulators (Any 3 × 1) (3)

1.6 It means connecting the alternator into the grid in parallel with other alternators✓ that are live in a system of constant voltage and frequency.✓ (2)

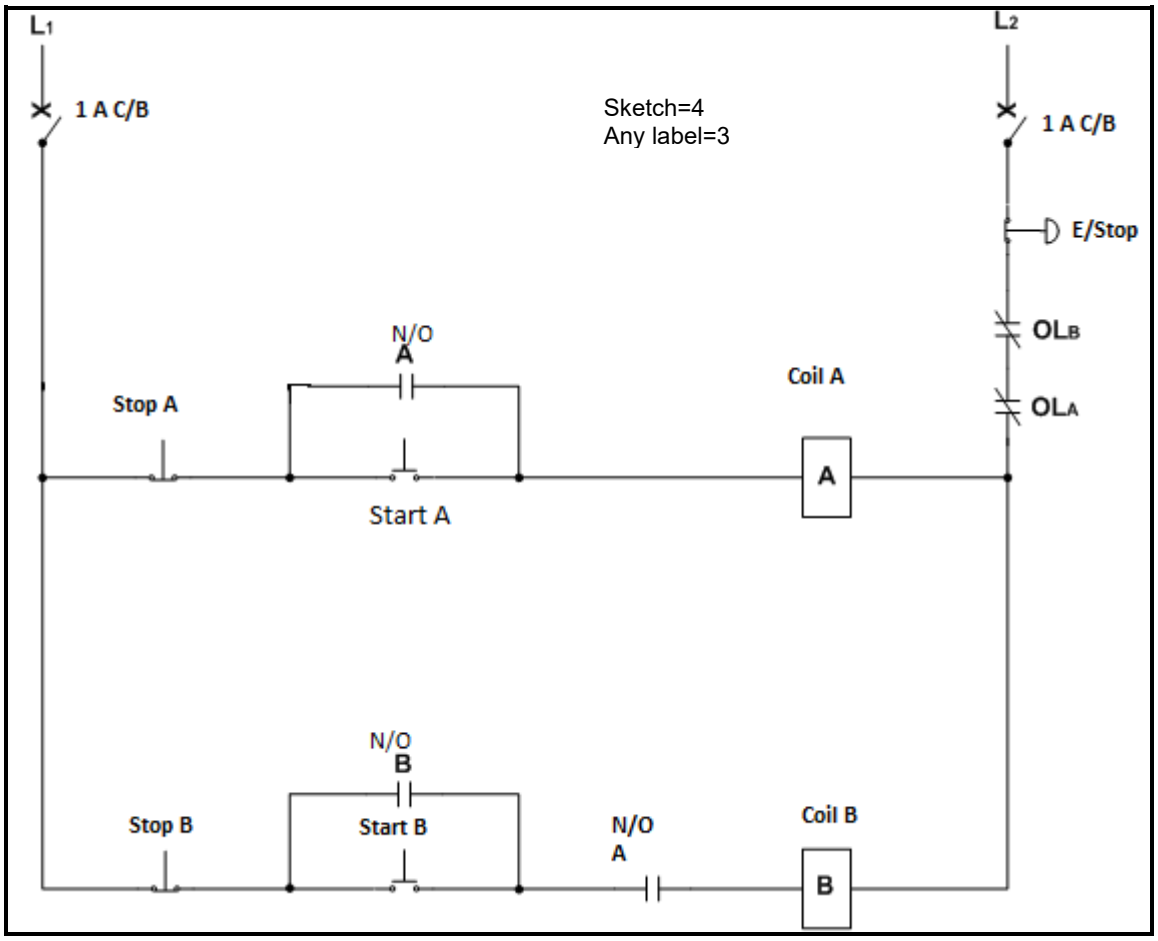
1.7 Surge arrestors are devices that conduct surges✓ (such as those caused by lightning flashes) to the ground✓ before they can cause damage.✓ (3)

[20]

QUESTION 2

2.1
- Wiring diagrams
- Schematic diagrams
- Pictorial diagrams (Any 2 × 1) (2)

2.2



(7)

2.3 Ensures that the installation is connected according to SANS 10142

OR

Ensures that the circuit complies with the relevant national regulations and standards (1)

2.4
- Waste time due to unpreparedness
- Waste money due to inefficiency
- Frustration and not enjoying work
- Give clients a poor impression
- Accidents due to incorrect tools or safety equipment (Any 3 × 1) (3)

2.5 Automatically isolates the circuit✓ when there is an earth fault current✓

OR

Trips the circuit✓ when there is a leakage current to earth✓ (2)

[15]

QUESTION 3

3.1
- SANS 1418
- Occupational Health and Safety Act
- Eskom reticulation specifications
- Municipal/Local authority bylaws (Any 3 × 1) (3)

3.2
- Terrain (hills, valleys, rivers)
- Obstacles (trees, buildings, telephone lines)
- Spacing between poles
- Number of conductors to be carried on each pole (Any 3 × 1) (3)

3.3
- Atmospheric temperature and wind may affect the sag of overhead conductors.
- Wind may affect the pole supports, stays and clearances.
- Lightning may cause voltage surges to the network.
- Salt fog may corrode conductors and components (near the coast).

(Any 3 × 1) (3)

3.4 Ensures that conductors remain at a safe distance from people, the environment and each other (2)

3.5 Stabilises the poles,✓ especially where the direction of the overhead lines changes✓ (2)

3.6 It is a shorter pole used to push against the pole carrying the electric cables,✓ when there is no space for a stay cable to pull the pole.✓

OR

It is a shorter pole used to balance the pole carrying electric cables,✓ when there is no space for a stay cable to pull the pole.✓ (2)

[15]

QUESTION 4

4.1
4.1.1 True
4.1.2 False
4.1.3 False
4.1.4 False
4.1.5 True
4.1.6 False
4.1.7 False
4.1.8 False
4.1.9 True
4.1.10 False

(10 × 1) (10)

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4.2 4.2.1 Verifies the power operation✓ of overload relays, moulded-case circuit breakers and ground-fault trip devices✓

4.2.2 Measures and analyses✓ the impedance of circuits and components✓

(2 × 2) (4)

4.3
- Confined spaces
- Poor lighting
- Unstable platforms
- Flammable or potentially flammable gases
- Live wires (Any 3 × 1) (3)

4.4
- It must be for the range of measurement values to be measured.
- It must be calibrated.
- It must meet the required safety standard. (Any 2 × 1) (2)

4.5 Section 4 (1)

[20]

QUESTION 5

5.1
- Signs of dampness
- Any abnormal condition (e.g. smoke, oil leaks, etc.)
- General condition of the switchgear, such as rust, padlocks, etc.
- Condition of auxiliary equipment (Any 3 × 1) (3)

5.2
- Use the correct size of components, equipment and material.
- Use the correct ratings of devices or wire.
- Do not use damaged equipment.
- Have an extra cable. (4)

5.3
- Keep the motor clean.
- Check for accurate shaft alignment.
- Check for belt condition and belt tension.
- Check for heating.
- Check for dampness.
- Check bearing condition.
- Check for abnormal noise. (Any 3 × 1) (3)

5.4 It means narrowing down the fault✓ to the component suspected to be the cause of the problem✓ and replacing it with one that is working.✓ (3)

5.5
- Lack of oil in the transformer
- Breakdown of the insulating material (2)

[15]

QUESTION 6

6.1 6.1.1 Cells that convert solar energy directly into electrical energy (1)

6.1.2 Percentage of the capacity of a battery to which it can be discharged without being damaged (2)

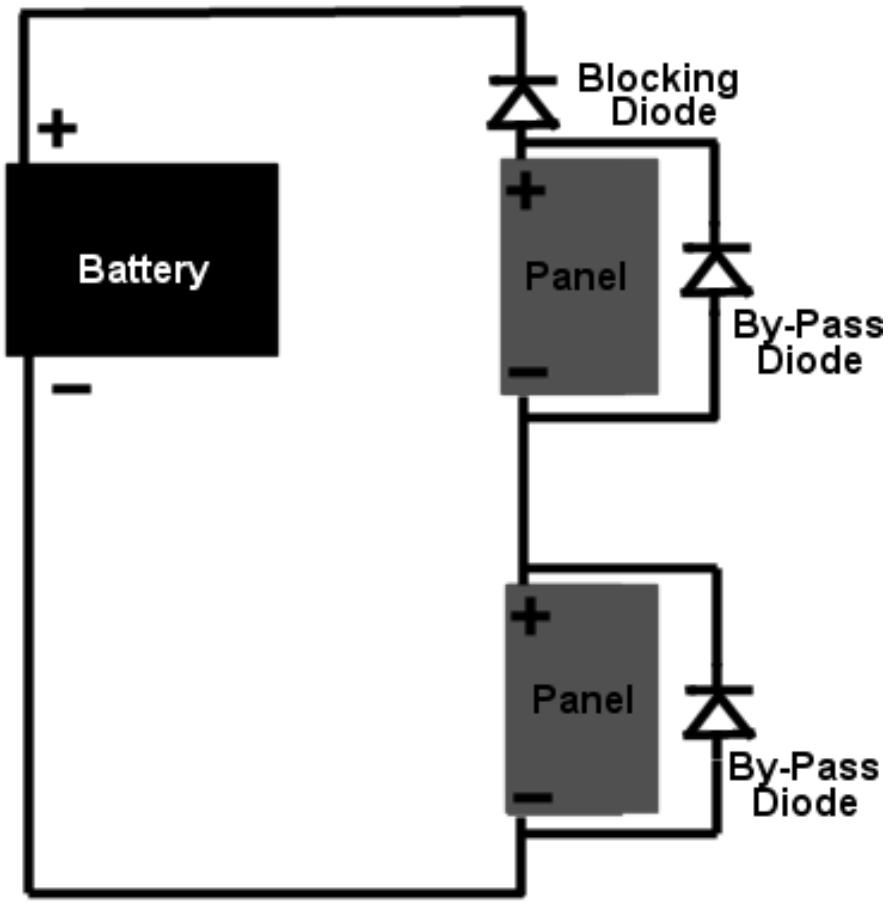
6.2

$$BDD = \frac{E_{DAILY} \times days}{E_{MIN}}\% \checkmark$$

$$BDD = \frac{3{,}4 \times 3}{20}\% \checkmark$$

$$BDD = 51\% \checkmark$$ (3)

6.3



(3 for drawing + 3 for labels) (6)

6.4

$$V_{DROP} = \frac{R_W \times 1 \times I}{1\,000} \checkmark$$

$$V_{DROP} = \frac{30 \times 15 \times 3}{1\,000} \checkmark$$

$$V_{DROP} = 1{,}35\ V \checkmark$$ (3)

[15]

TOTAL: 100

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