higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE (VOCATIONAL)

ELECTROTECHNOLOGY
NQF LEVEL 2

21 NOVEMBER 2023

This marking guideline consists of 6 pages.

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QUESTION 1

1.1 1.1.1 False
1.1.2 False
1.1.3 True
1.1.4 False
1.1.5 True

(5 × 1) (5)

1.2 *Ohm's law* states that the current flowing in a circuit is directly proportional to the applied voltage across the circuit✓ and inversely proportional to the resistance of the circuit,✓ provided that the temperature remains constant.✓ (3)

1.3 1.3.1 $\frac{1}{R_p} = \frac{1}{R_2} + \frac{1}{R_3}$

$\frac{1}{R_p} = \frac{1}{34} + \frac{1}{42}$ ✓

$\frac{1}{R_p} = \frac{42 + 34}{1428}$ ✓

$R_p = 18{,}79\ \Omega$ ✓ (3)

1.3.2 $R_T = R_1 + R_p$

$R_T = 18 + 18{,}79$ ✓

$R_T = 36{,}79\Omega$ ✓ (2)

1.3.3 $V_p = I_T \times R_p$

$V_p = 9 \times 18{,}79$ ✓

$V_p = 169{,}11V$ ✓ (2)

1.3.4 $I_{R2} = \frac{V_p}{R_2}$

$I_{R2} = \frac{169{,}11}{34}$ ✓

$I_{R2} = 4{,}974\ A$ ✓ (2)

1.4 $\frac{I_2}{I_1} = \frac{N_1}{N_2}$

$I_2 = \frac{N_1 \times I_1}{N_2}$

$I_2 = \frac{150 \times 0{,}2}{15}$ ✓✓

$I_2 = 2\,A$ ✓ (3)

[20]

QUESTION 2

2.1 2.1.1
- A – pictorial drawing
- B – circuit diagram (2)

2.1.2 $I = \frac{V}{R}$

$I = \frac{12}{3}$ ✓

$I = 4\,A$ ✓ (2)

2.1.3 $P = V \times I$

$P = 12 \times 4$ ✓

$P = 48\,W$ ✓

Alternative 1:

$P = I^2 \times R$

$P = (4)^2 \times 3$

$P = 48\,W$

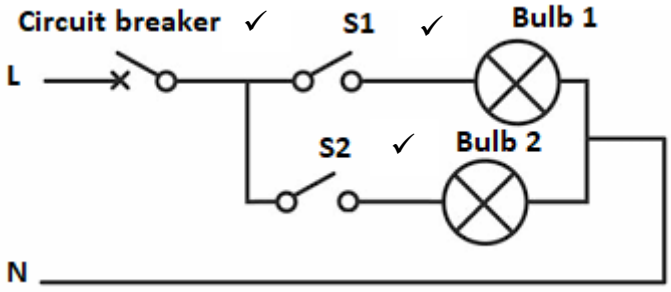
Alternative 2:

$P = \frac{V^2}{R}$

$P = \frac{(12)^2}{3}$

$P = 48\,W$ (2)

2.2



(3)

2.3
- Single-core PVC insulated cable
- Flat twin and earth cable
- Surfix cable
- Bare copper earth wire (4 × 1) (4)

2.4
- Wire stripper
- Cable knife
- Soldering iron
- Side cutter/pliers (4 × 1) (4)

2.5 The main load current passes through a bimetallic strip.✓ When it is heated,✓ it will deflect, causing the auxiliary circuit to be 'off'.✓ (3)

2.6
- Always check that the blade is of the proper pitch for your work piece.
- Ensure that the teeth point away from the handle.
- Check that the blade is not loose in the handle.
- Apply pressure on forward strokes only.
- When a hacksaw is not in use, the tension in the frame should be released by loosening the wing nut.
- The tension piece and wing nut must be oiled often. (Any 5 × 1) (5)

[25]

QUESTION 3

3.1
3.1.1 D
3.1.2 C
3.1.3 B
3.1.4 F
3.1.5 A
3.1.6 E

(6 × 1) (6)

3.2
3.2.1 Wire stripper – to strip insulation off the wire.

3.2.2 Soldering Iron – to join components with solder to each other.

3.2.3 Solder pump – to loosen components from a circuit board.

3.2.4 Long-nose pliers – to bend wires and to get into difficult-to-reach places.

3.2.5 Oscilloscope – to provide visual presentation of wave forms.

3.2.6 Multimeter – to measure current voltage and resistance.

(6 × 1) (6)

3.3 A – Voltage AC – High voltage
B – Voltage AC – Low voltage
C – Voltage DC
D – Voltage DC
E – Voltage DC

(5 × 1) (5)

3.4 3.4.1 Use breadboard for test circuit
3.4.2 Use vero board for permanent circuit

(2 × 1) (2)

3.5 3.5.1 Low
3.5.2 High
3.5.3 Low
3.5.4 High
3.5.5 High
3.5.6 High

(6 × 1) (6)
[25]

QUESTION 4

4.1 4.1.1 0,333 A
4.1.2 0,667 A
4.1.3 1 A
4.1.4 1,333 A
4.1.5 1,667 A

(5 × 1) (5)

4.2
- Switch on and measure the input and output voltages of the transformer with a multimeter on the volt scale. Check the input side of the transformer first. The full AC voltage should be present.
- Next check the output side. If there is no voltage or if the voltage on the output side is lower than it is supposed to be, the transformer will need to be tested to find out where the fault lies.
- With the power off, remove the transformer from the equipment and perform a resistance or continuity test on both the primary and secondary winding.
- If there is no resistance or ohm reading on the primary and secondary winding, the cause may be an open winding. The transformer will need to be replaced.
- Also check if there is a burning smell or if the transformer is getting very hot. This may be a short circuit developing in either the primary or the secondary winding. An insulation resistance test can also be performed.

(5 × 1) (5)

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4.3 4.3.1 Disconnect both sides of the cable being tested and connect the cable to the two sides of a multimeter on the ohm scale.✓ Make sure that you connect the same colour wire (e.g., brown) on both sides of the meter.✓ A low reading will indicate continuity and no reading will indicate an open circuit in the cable.✓ (3)

4.3.2 Connect the leads of the insulation tester between the cable's cores (e.g., between brown and blue).✓ A reading below 1 MΩ will indicate an insulation breakdown between the cores.✓ (2)

4.4 The fault is traced by starting with the input✓ and then proceeding through all the stages towards the output section.✓ (2)

4.5 Once you have identified the faulty component, you will have to replace it✓ and then test the installation to see if everything is working normally.✓ When you are satisfied that it works, switch off everything and retest again.✓ (3)
[20]

QUESTION 5

5.1

Description	**Qty**
Distribution board with an earth and neutral bar	1
63 A isolator	1
63 A earth leakage	1
10 A circuit breaker	1
20 A circuit breaker	2
40 A circuit breaker	1

(Any 5 × 1) (5)

5.2
- The level of customer satisfaction with existing products.
- The characteristics that will improve the product according to customers.
- The volume of purchases made each month.
- The amount of money spent on the product each month.
- The price that customers would be willing to pay for an improved product.

(5 × 1) (5)
[10]

TOTAL: 100

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