higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE (VOCATIONAL)

ELECTRICAL PRINCIPLES AND PRACTICE
NQF LEVEL 2

15 November 2024

This marking guideline consists of 7 pages.

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QUESTION 1

1.1 True
1.2 False
1.3 False
1.4 False
1.5 False
1.6 True
1.7 True
1.8 False
1.9 True
1.10 True

(10 × 1) **[10]**

QUESTION 2

2.1
2.1.1 G✓
2.1.2 H✓
2.1.3 F✓
2.1.4 J✓
2.1.5 D✓
2.1.6 C✓
2.1.7 A✓
2.1.8 B✓
2.1.9 K✓
2.1.10 I✓

(10 × 1) (10)

2.2
2.2.1 A battery stores energy that will move current from terminal to another terminal through the circuit.✓

2.2.2 Switches turns the current in a circuit on or off.✓

2.2.3 A lamp is the load, it indicates the presence of current when the switch is closed.✓

2.2.4 Connecting wires are conducting wires they allow the flow of current.✓

(Any other relevant answer 4 × 1) (4)

2.3 $R_T = R_0(1 + \alpha T)$✓
$= 60\Omega(1 + 0{,}004 \times 25)$✓
$= 66\Omega$✓ (3)

2.4
- The generated voltage is transmitted at a very high voltage
- Overhead power lines and underground cables for high voltage transmission are used
- The voltage is then stepped down at he substation to 11KV
- The supply voltage is then distribution to towns and cities.
- The supply voltage is then further stepped down to local substation as three phase four wire systems (230/400V).
- The generated electricity is then distributed for use in homes and businesses (230/400V)..✓ (6)

2.5 The first law of magnetism is states that magnetic poles repel one another✓ and unlike magnetic poles attract one another.✓ (2)
[25]

QUESTION 3

3.1 3.1.1
$$r_T = \frac{r}{n}$$
$$= \frac{0,6}{3}\checkmark$$
$$= 0,2\Omega\checkmark$$

3.1.2 $E_T = E_1 = E_2 = E_3\checkmark = 1,2\,V\checkmark$

3.1.3
$$I_T = \frac{E}{(R_T + r_T)}$$
$$\frac{1,2\,V}{(24\Omega + 0,2\Omega)}\checkmark$$
$$= 0,496A\ \checkmark$$

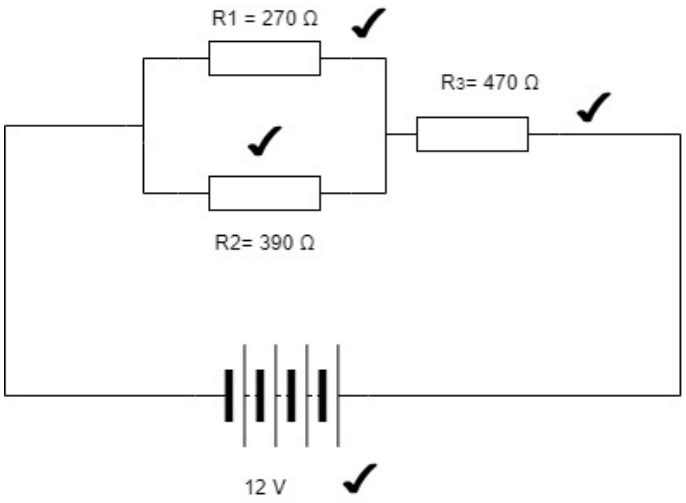
3.1.4
$$\frac{I_T}{n} = \frac{0,496\,A}{3}\ \checkmark$$
$$= 0,165\,A\ \checkmark$$

3.1.5
$$Pd = I_T \times R_T$$
$$= (0,496\,A)(24\Omega)\checkmark$$
$$= 11,904\,V\checkmark$$

(2 × 5) (10)

3.2 When resistors are connected in series the voltage adds up(sum of all the volt drops across each resistor),✓ the current remains the same✓ and the resistance increases✓ (3)

3.3 3.3.1 (4)



3.3.2 $R_p = \frac{\text{R1 x R2}}{\text{R1 + R2}}$

$= \frac{270 \text{ x } 390}{270 + 390}$ ✓

$= 159{,}545\Omega$✓

$R_T = R_p + R_3$ ✓
= 159,545 + 470 ✓
= 629,545 Ω ✓ (5)

3.3.3 $I_T = \frac{V}{(R_T)}$

$\frac{12}{629{,}545}$ ✓

$= 0{,}019\ A$ ✓ (2)

3.4
- Each phase conductor carries the same current value.✓
- The neutral conductor carries a small current or, if possible, no current at all. (1)
- Smaller cables are required. (Any ONE) **[25]**

QUESTION 4

4.1 4.1.1 C✓
4.1.2 A✓
4.1.3 D✓
4.1.4 A✓
4.1.5 B✓ (5 × 1) (5)

4.2 The purpose of bonding is to allow all non-current-carrying components of an electrical system to be at the same electrical potential✓ and to be connected to the earth ✓ to reduce danger of electric shock due to an electrical fault.✓ (3)

4.3 Analogue meters are those meters where data are represented on the instrument by means of a movable mechanism such as a pointer.
Digital meters are those meters where data are represented on the instrument by means of a light-emitting diode. (2)

4.4 Electrodynamometer or dynamometer (1)

4.5
- Before taking any measurements, ensure that the pointer is at zero in an analogue meter.✓
- Do not clamp on a bare conductor.✓
- Always start with the highest scale on the meter when measuring unknown values. (Any other TWO relevant answers) (2)

4.6
- Current transformer
- Potential transformer (2)

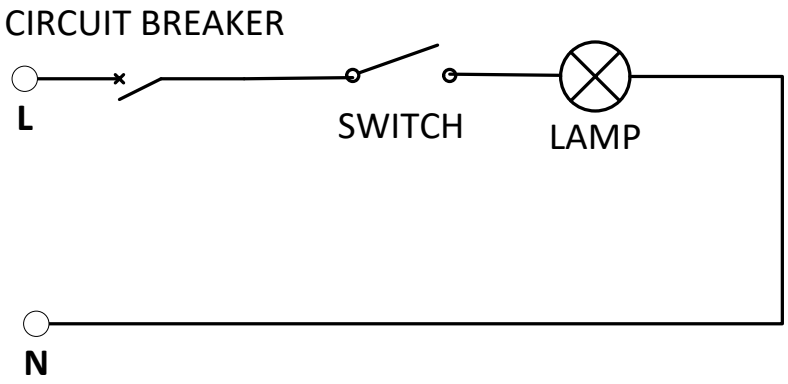
[15]

QUESTION 5

5.1 5.1.1 A circuit breaker is used to protect a circuit from electrical overload.✓

5.1.2 A fuse is a protective device that destroy itself or blows✓ and breaks the circuit if the current exceeds the rating of the fuse.✓ (2)

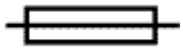
5.2

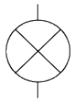


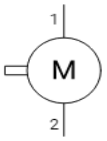
(5)

(ONE mark for each component, including a circuit breaker, live and neutral wires)

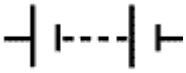
5.3 5.3.1 

5.3.2 

5.3.3 

5.3.4 

5.3.5 

5.3.6 

5.3.7 

(7 x 1) (7)

5.4 The function of the intermediate switching is to cross-connect wires between the two-way switches. (1)
[15]

QUESTION 6

6.1
- Zink- chloride cell
- Mercury cell
- Silver oxide cell (3)

6.2 Incandescent lamp is a low cost lamp with low efficiency (does not last long)

Compact fluorescent lamp is an energy saving lamp (high efficient lamp that lasts long) (2)

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6.3
- Malleable, soft and ductile
- It is light in weight or low density
- Has low tensile strength
- It is cheaper than copper
- Resistant to corrosion (5)

[10]

TOTAL: 100

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