higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE (VOCATIONAL)

ELECTRICAL PRINCIPLES AND PRACTICES
NQF LEVEL 2

10 November 2022

This marking guideline consists of 8 pages.

Copyright reserved

INSTRUCTIONS TO MARKERS

1. Mark all the questions.
2. Follow the answers according to the numbering system used in this question paper.
3. Use only a red pen.
4. Put your ticks and crosses neatly and legibly.

Copyright reserved

QUESTION 1

1.1 $130\ mm = \frac{130}{1000}$✓ $= 0{,}13\ m$✓ (2)

1.2
1.2.1 False
1.2.2 False
1.2.3 True
1.2.4 False
1.2.5 False

(5 × 1) (5)

1.3 $v = \frac{d}{t}$

$= \frac{10\ \times 1000}{30 \times 60}$✓

$= 5,56\ m/s$✓ (2)

1.4 Power is the rate of energy transfer. (1)
[10]

QUESTION 2

2.1
2.1.1 C
2.1.2 D
2.1.3 E
2.1.4 B
2.1.5 A

(5 × 1) (5)

2.2 $Given$: $r = 0{,}78\ \Omega$; $I = 2\ A$; $emf = 1{,}8\ V$

$Potential\ difference\ (pd) = E - Ir$

$= 1{,}8$ ✓$- [2\ \times 0{,}78\ ]$✓

$= 0,24\ V$✓ (3)

2.3 2.3.1 Magnetic flux is a measure of the total magnetic field✓ including magnetic strength and size of the magnetic field. ✓

2.3.2 Magnetic flux density is a measure of the strength of a magnetic field✓ at a particular point.✓ (2)

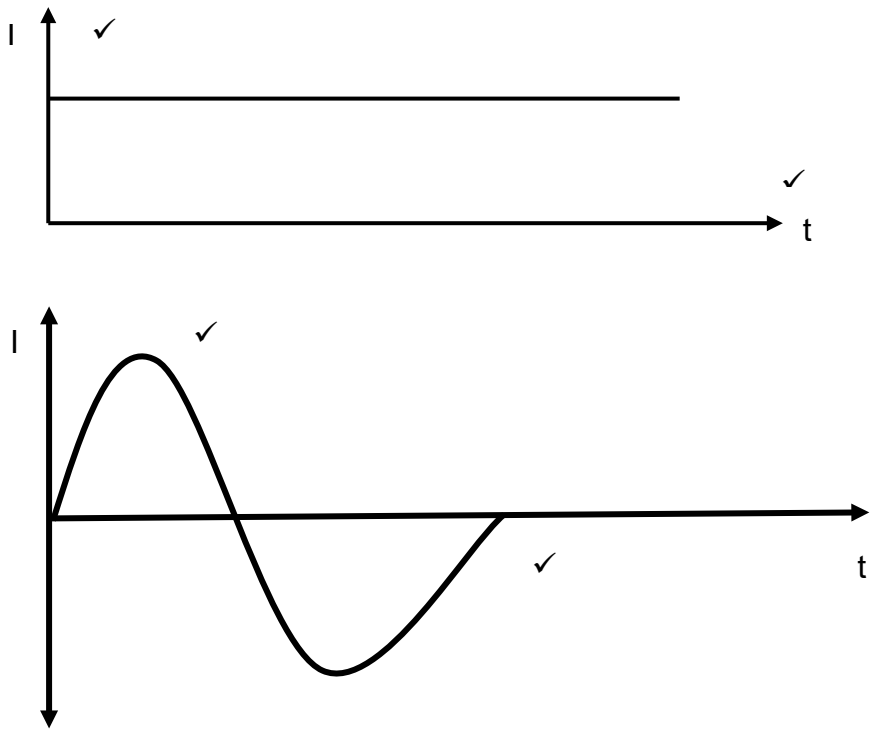
2.4 2.4.1 divided
the same or equal

2.4.2 the same or equal
divided (4)

2.5 Three phase supply system consists of 3 identical coils(windings) around the stator,
These coils are placed 120 degrees from each other
So to complete 1 revolution/360 degree
The time delay is also one third of a period between the three voltages
When the magnetic field is rotated, the emf is induced on the three windings
Hence the magnitude and frequency of these emf are the same or equal in each winding
From these coils, 3 conductors are connect and named/labelled Red, White Blue or L1 L2 and L3

(Any relevant answer) (5)

2.6



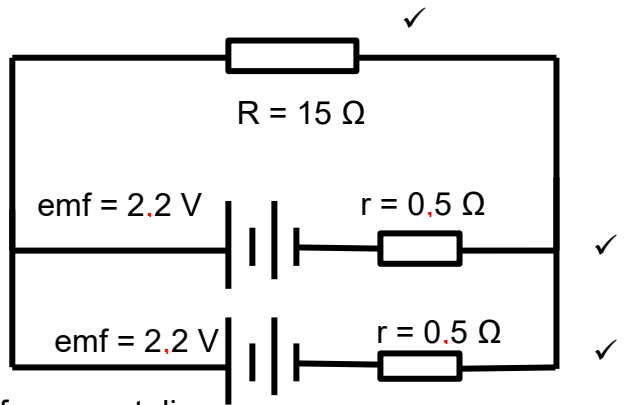
(4)
[25]

I or V

QUESTION 3

3.1 In an open circuit, no current will flow as there is no continuity in the circuit. ✓ (1)

3.2 3.2.1



One mark for correct diagram (4)

3.2.2 $r_T = \frac{r_1}{n}$

$r_T = \frac{0,5}{2}$ ✓

$r_T = 0,25\ \Omega$ ✓

Alternative:

$r_T = \frac{r_1 \times r_2}{r_1 + r_2}$

$r_T = \frac{0,5 \times 0,5}{0,5 + 0,5}$

$r_T = 0,25\ \Omega$

$R_T = R + r_T$

$= (15 + 0,25)$ ✓

$= 15,25\ \Omega$ ✓ (4)

3.2.3 $I_T = \frac{emf_T}{R + r}$

$= \frac{2,2}{15,25}$ ✓

$= 0,144\ A$ ✓ (2)

3.2.4 $Voltage\ drop = I.R$

$= (0,144)(15)$ ✓

$= 2,16\ V$ ✓ (2)

3.3 3.3.1 $R_T = R_1 + R_2 + R_3$

$= 15 + 22 + 33$ ✓

$= 70\ \Omega$ ✓

3.3.2 $I_T = \frac{V_T}{R_T}$

$= \frac{9}{70}$ ✓

$= 0,129\ A$ ✓

3.3.3 $V = I.R$

$= 0,129\ \times 15$ ✓

$= 1,935\ V$ ✓

(3 × 2) (6)

3.4
- Each phase conductor carries the same current value
- The neutral conductor carries a small current or, if possible, no current at all
- Smaller cables are required (Any 1× 1) (1)

3.5 When an alternating voltage is applied to the primary windings while the secondary winding is open✓ (without load connected to the secondery side) a small current will flow. This current is called magnetising current. ✓ An alternating magnetic field is set up in the core✓ which is linked with the turns of the secondary winding.✓ This allternating magnetic field induces an emf in the secondary winding.✓ (5)

[25]

QUESTION 4

4.1
- The main reason for earthing is to prevent the risk of people and animals being shocked or electrocuted
- Earthing provides a sufficiently low impedance to enable satisfactory protection under fault conditions
- Earthing keeps system voltages within reasonable limits under fault conditions such as lightning and ensures that insulation breakdown voltages are not exceeded.
- Earthing is required to comply with regulations and the code practice.

(Any 3 × 1) (3)

4.2
- An operating or deflecting device
- A damping device
- A controlling device (3)

4.3 When current flows in the solenoid,✓ the soft iron bar is attracted towards the solenoid✓ and the movement results in the deflection of the pointer.✓ (3)

4.4 4.4.1 A voltmeter is always connected in parallel in a circuit

4.4.2 An ohmmeter is always connected in parallel in a circuit.

4.4.3 An ammeter is always connected in series in a circuit

4.4.4 A frequency meter is connected in parallel in a circuit.

(4 × 1) (4)

4.5
- Never use an insulation tester on live circuit
- Always rotate the cranking handle clockwise when using an analogue insulation tester
- Do not touch the points of the insulation tester while performing the test

(Any 2 × 1) (2)

[15]

QUESTION 5

5.1 5.1.1



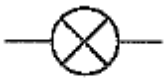
✓

5.1.2



✓

5.1.3



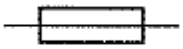
✓

5.1.4



✓

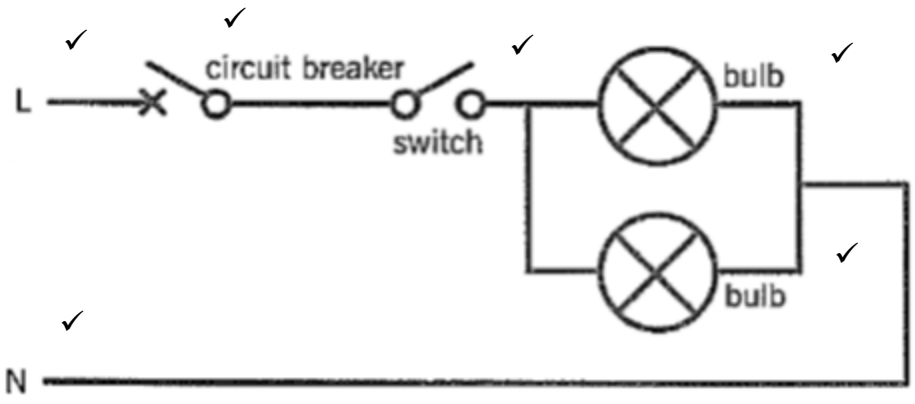
5.1.5



✓

(5 × 1) (5)

5.2



✓ ✓ ✓ ✓ ✓ ✓ ✓

(6)

5.3 5.3.1 35 A
5.3.2 10 A
5.3.3 20 A
5.3.4 20 A

(4 × 1) (4)
[15]

QUESTION 6

6.1
- Weigh lesser
- Less corrosive
- An alloy of iron and a small amount of carbon
- Malleable
- Harder and more elastic than iron (Any 3 × 1) (3)

6.2 6.2.1 Pin-type insulator supports the conductor above the structure.

6.2.2 Strain-type insulator must be strong enough mechanically to support the full weight of the span of the conductor.

(2 × 1) (2)

6.3
- Circuit breakers
- Earth leakage unit
- Geyser isolator
- Earth bar
- Neutral bar
- Geyser timer
- Energy/Power/watt-hour meter
- Surge arrestor

(Any 5 correct answers) (5)
[10]

TOTAL: 100

Copyright reserved