higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

ELECTRICAL TRADE THEORY N1

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This marking guideline consists of 4 pages.

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QUESTION 1

1.1 Interrupts any current,✓ extinguishes any arc and withstands any explosion that might take place in the circuit✓ without igniting any of the flammable substances that may be present in the surroundings of the protected hazardous location✓ (3)

1.2
- Open flames
- Faulty electrical apparatus
- Carelessness
- Radiant (open element) (Any relevant 4 × 1) (4)

1.3 Used for stripping covering sheaths of cables and insulation of conductors.✓✓ Care must be taken not to nick the conductors.✓ Cutting should be done at an angle, similar to sharpening a wooden pencil.✓ (4)
[11]

QUESTION 2

2.1 EMF is the voltage of a source not delivering a current.✓ Its value is always measured over an open circuit✓ whereas potential difference is the voltage measured when the source is delivering current,✓ also known as closed-circuit voltage.✓ (4)

2.2 2.2.1

$R_P = (R_2 \times R_3) \div (R_2 \div R_3)$
$= (12 \times 24) \div (12 + 24)$ ✓
$= 8\ \Omega$✓

$R_T = R_P + R_1$
$= 8 + 8$
$= 16\ \Omega$✓ (3)

2.2.2
$I_T = V_T \div R_T$
$= 100 \div 16$ ✓✓
$= 6{,}25$ A✓ (3)

2.2.3
$V_{R1} = I_T \times R_1$
$= 6{,}25 \times 8$ ✓✓
$= 50$ V ✓ (3)

2.2.4
$V_P = I_T \times R_P$
$= 6{,}25 \times 8$ ✓✓
$= 50$ V ✓

OR

$V_T = V_{R1} + V_P$
$V_P = 100 - 50$✓✓
$= 50$ V ✓ (3)

2.2.5
$I_{R2} = V_P \div R_2$
$= 50 \div 12$✓
$= 4{,}167$ A✓

AND

$I_{R3} = V_P \div R_3$
$= 50 \div 24$✓
$= 2{,}083$✓ (4)
[20]

QUESTION 3

3.1 Ratio of magnetic flux to cross-sectional measured in telsa (T)✓✓ (2)

3.2 Used to absorb moisture from the air sucked in by the transformer during the breathing process✓✓ (2)

3.3 3.3.1 $(10 \div 1) = (V_1 \div V_2)$
$V_2 = (2600 \times 1) \div (10)$ ✓
$= 260$ V ✓ (2)

3.3.2 $(10 \div 1) = (I_2 \div I_1)$
$I_2 = (10 \times 30) \div (1)$ ✓
$= 300$ A ✓

OR

$(I_2 \div I_1) = (V_1 \div V_2)$
$I_2 = (2600 \times 30) \div (260)$ ✓
$= 300$ A ✓ (2)

3.3.3 $S = V_1 \times I_1$
$I_1 = (100\,000 \div 2600)$ ✓ AND
$= 38{,}46$ A ✓

$S = V_2 \times I_2$
$I_2 = (100\,000 \div 260)$ ✓
$= 384{,}62$ A ✓ (4)

[12]

QUESTION 4

4.1
- Not very robust
- Continuous maintenance
- Must not be left in discharged condition
- Relatively short life
- Heavy for the energy it delivers
- Dangerous, contains acid

(Any 4 × 1) (4)

4.2 Ratio of the weight of a unit volume of electrolyte to a unit volume of water✓✓ (2)

4.3 Average value of wave taken over half a cycle.✓✓ For a sine wave the average value = 0,637 × maximum value,✓ the average values of voltage and current are of little practical value.✓ (4)

4.4

MOVING-IRON INSTRUMENT	MOVING-COIL INSTRUMENT
• Non-linear scale • Can measure d.c and a.c • Cheap • Robust • Affected by stray magnetic fields • Not very accurate • Damping by air • Controlled by springs or gravity (Any FIVE)	• Linear scale • Can measure only d.c • Expensive • Easily damaged • Not affected by stray magnetic field • Very accurate • Damping by eddy current • Controlled by springs (Any FIVE)

(2 × 5) (10)

[20]

QUESTION 5

5.1
5.1.1 D
5.1.2 E
5.1.3 A
5.1.4 B
5.1.5 C

(5 × 2) (10)

5.2
- Expensive
- Cannot be coloured, identified by means of numbered code
- Fairly difficult to work with (Any relevant 3 × 1) (3)

[13]

QUESTION 6

6.1 Detects over-currents or short-circuit currents and automatically disconnects faulty equipment or circuit from supply (3)

6.2
- Grill element
- Bake element
- Bake aid element (3)

6.3 The isolator (switch disconnector) shall be mounted within arm's reach from the terminals of the geyser✓✓ or in the distribution board,✓✓ but only if the isolator is capable of being locked in the OFF position.✓✓ (6)

[12]

QUESTION 7

7.1
- Insulation resistance between live and neutral
- Insulation resistance between conductors and earth
- Polarity of switches
- Earth continuity
- Earth-leakage relay (5)

7.2
- Power factor improvement
- Phase displacement in starting single-phase induction motors (2)

7.3 $C_T = (C_1 \times C_2) \div (C_1 + C_2)$
$= [(60 \times 10^{-6}) \times (100 \times 10^{-6})] \div [(60 \times 10^{-6}) + (100 \times 10^{-6})]$ ✓✓✓
$= 37{,}5\ \mu F$✓✓ (5)

[12]

TOTAL: 100

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