higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

ELECTRICAL TRADE THEORY N1

2 AUGUST 2019

This marking guideline consists of 5 pages.

Copyright reserved

QUESTION 1

1.1
- Lock-out switch
- Isolator
- No-volt coil
- Overload coil
- Earth-leakage device
- Isolating link
- Isolating switch (Any 4 × 1) (4)

1.2
- Electrical equipment
- Distribution boards
- Start buttons
- Stop buttons
- Emergency stop buttons
- Equipment
- Guards
- Covers
- Fresh and dirty water pipes
- Oil and gas pipes
- Safety valves (Any 3 × 1) (3)

1.3
- Excessive pressure must not be exerted on it.
- It is used to crimp ferrules and lugs onto conductors. (2 × 2) (4)

[11]

QUESTION 2

2.1 It is the movement of electrons in a specific direction through a material. (2)

2.2 2.2.1 $EMF_T = EMF_1 \times$ number of cells
$= 2,2 \times 6$✓
$= 13,2$ V✓ (2)

2.2.2 $r_t = r_1 \times$ number of cells
$= 0,1 \times 6$✓
$= 0,6\ \Omega$✓ (2)

2.2.3 $R_T = R + r_t$
$= 10 + 0,6$✓
$= 10,6\ \Omega$✓ (2)

2.2.4 $I_T = EMF_T \div R_T$
$= 13,2 \div 10,6$✓✓
$= 1,245$ A✓ (3)

Copyright reserved

2.2.5 $V_{10\Omega} = I_T R_{10\Omega}$
$= 1{,}245 \times 10$✓
$= 12{,}45$ V✓ (2)

2.2.6 $V_d = I_T \times r_t$
$= 1{,}245 \times 0{,}6$✓
$= 0{,}75$ V✓ (2)

2.3 $R = Pl/A$

$$= \frac{0{,}0172 \times 10^{-6} \times 500}{28 \times 10^{-6}}$$

$= 0{,}304$ ohms (3)
[18]

QUESTION 3

3.1
- Natural magnets
- Permanent magnets
- Electromagnets (3)

3.2 3.2.1 $V_1/V_2 = N_1/N_2$
$N_1 = (V_1 \times N_2)/V_2$
$= (2\,200 \times 200)/440$✓
$= 1\,000$ turns✓

3.2.2 $V_1 / V_2 = I_2/I_1$
$I_1 = (V_2 \times I_2)/V_1$
$= (440 \times 60)/2\,200$✓
$= 12$ A✓

3.2.3 $S_2 = V_2 I_2$
$I_2 = S_2 / V_2$
$= 50\,000 \div 440$✓
$= 113{,}636$ A✓
(3 × 2) (6)

3.3
- Primary
- Secondary
- Magnetic (3)
[12]

QUESTION 4

4.1
- The voltage required by the load
- The current-delivering capacity that is required
- The duration of current flow
- The life expectancy of the cell
- The shelf life of the cell
- The relative costs of the various cells
- The internal resistance of the cell
- The physical size and mass of the cell
- The operating temperatures (Any 5 × 1) (5)

4.2
- Chemical reaction – primary and secondary cells and batteries
- Electromagnetic induction – AC and DC generators
- Solar energy conversion – solar cells
- Heat – thermocouple pyrometer
- Friction – electric charges (silk and glass) (Any 4 × 2) (8)

[13]

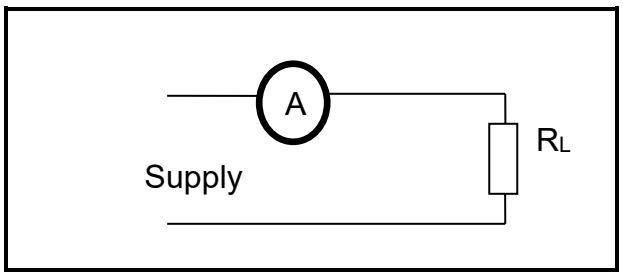
QUESTION 5

5.1 It is the effective value of the current or voltage or that value of current which is equivalent to direct current when compared on an energy basis. (4)

5.2
- It is cheaper to generate and transmit.
- Three-phase motors are more efficient and can be constructed in large sizes. (2)

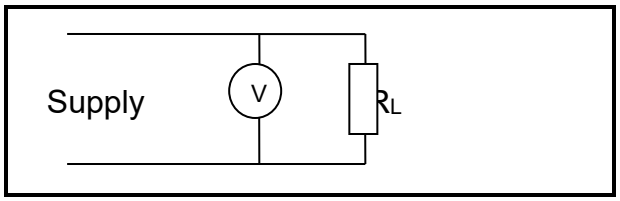
5.3
- Series and shunt resistors
- Instrument transformers (2)

5.4 5.4.1



Supply ✓
R_L ✓
Ammeter ✓

5.4.2



Supply ✓
R_L ✓
Voltmeter ✓

(2 × 3) (6)

[14]

QUESTION 6

6.1 It is a wire, cable or substance that is suitable for carrying electric current. (2)

6.2
- Must be durable
- Must be readily available
- Must not be too expensive
- Must be mechanically strong (4)

6.3
- Fixed appliance: fixed-press drill, lathe, fixed air conditioner
- Portable appliance: portable drilling machine, vacuum cleaner
- Stationary appliance: stove, fridge (3 × 2) (6)

6.4 It is to guard every electrical installation, machine, appliance or apparatus against the effects of leakage currents, static charges and lightning discharges. (4)

[16]

QUESTION 7

7.1
7.1.1 Ohmmeter
7.1.2 Megger/Insulation resistance tester
7.1.3 Insulation resistance tester (megger)
7.1.4 Ohmmeter

(4 × 1) (4)

7.2 It shall not exceed 0,2 Ω. (2)

7.3 It is a semiconductor diode which emits light when a voltage is applied across it. (2)

7.4 $C_T = C_1 + C_2$✓
$= 6 + 20$✓
$= 26\ \mu F$✓ (3)

7.5 Blue = 6;✓ Orange = 3;✓ Yellow = 4;✓ Silver = ±10%✓
R = 630 000 Ω ± 10%
= 630 kΩ ± 10%✓ (5)

[16]

TOTAL: 100

Copyright reserved