higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE (VOCATIONAL)

ELECTRONIC CONTROL AND DIGITAL ELECTRONICS
NQF LEVEL 2

16 November 2023

This marking guideline consists of 6 pages.

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QUESTION 1

1.1
1.1.1 False
1.1.2 True
1.1.3 True
1.1.4 False
1.1.5 True
1.1.6 True
1.1.7 False
1.1.8 False
1.1.9 True
1.1.10 True

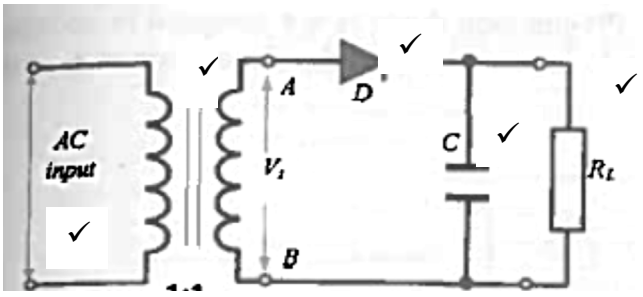
(10 × 1) (10)

1.2
1.2.1 C
1.2.2 E
1.2.3 D
1.2.4 A
1.2.5 B

(5 × 1) (5)

1.3 45 0000✓ pF✓ 10%✓ 250 V✓ (4)

1.4



(5)

1.5
- A transistor is a three-terminal device or component that consists of two PN-junctions.
- A transistor comprises three layers of semiconductor material manufactured on a single silicon or germanium crystal. (Any 1 × 1) (1)

[25]

QUESTION 2

2.1
- Op-amp
- Voltage regulator
- Amplifier
- Comparators
- Multiplier
- 555 timer (Any 2 × 1) (2)

2.2
- Inverting amplifier
- Non-inverting amplifier
- Summing amplifier
- Voltage follower
- Integrator
- Differentiator
- Audio amplifier (Any 2 × 1) (2)

2.3 A: Iron core transformer
B: Full bridge rectifier or diode
C: Polarised capacitor
D: Resistor (4 × 1) (4)

2.4
- Connect the positive probe of the meter to the base output and the negative first to the collector and then to the emitter (forward bias).✓ Obtaining a value in the range of ~450 - 1500 Ohm confirms correct operation of the transistor. Open circuit (resistance tends to infinity) indicates fault.✓
- Connect the negative probe to the base, and the positive probe first to the collector and then to the emitter (reverse bias).✓ The meter should indicate open circuit. A resistance reading indicates fault.✓
- Measure between the collector and emitter. ✓ The measured result should be open, regardless of whether we applied a positive or negative probe.✓ (6)

2.5 2.5.1 A desoldering sucker or solder sucker is used to remove molten solder.

2.5.2 A side cutter is used for cutting wires and trimming leads on the soldered side of a circuit board.

2.5.3 A cable knife is used to strip wires, trim objects and cut tracks.
(3 × 1) (3)

2.6 $\frac{1}{C_T} = \frac{1}{C_1} + \frac{1}{C_2}$✓

$= \frac{1}{22} + \frac{1}{33}$✓

$= 13{,}2\ \mu\text{F}$✓

OR

$C_T = \frac{C_1 \times C_2}{C_1 + C_2}$✓

$= \frac{(22 \times 10^{-6}\ F)(33 \times 10^{-6}\ F)}{(22 \times 10^{-6}\ F + 33 \times 10^{-6}\ F)}$✓

$= 13{,}2 \times 10^{-6}\ \text{F}$✓ (3)
[20]

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QUESTION 3

3.1 Analogue signals are continuous electrical signals that vary in time, while digital signals represent a physical quantity by a series of binary numbers.✓✓ (2)

3.2
- One (1) is used to represent a higher voltage level (high).
- Zero (0) is used to represent a lower voltage level (low). (2)

3.3 $\frac{342}{2} = 171{,}0 = 0 \times 2 = 0$

$\frac{171}{2} = 85{,}5 = 0{,}5 \times 2 = 1$

$\frac{85}{2} = 42{,}5 = 0{,}5 \times 2 = 1$

$\frac{42}{2} = 21{,}0\checkmark = 0 \times 2 = 0$

$\frac{21}{2} = 10{,}5 = 0{,}5 \times 2 = 1\checkmark$

$\frac{10}{2} = 5{,}0 = 0 \times 2 = 0$

$\frac{5}{2} = 2{,}5 = 0{,}5 \times 2 = 1$

$\frac{2}{2} = 1{,}0 = 0 \times 2 = 0$

$\frac{1}{2} = 0{,}5 = 0{,}5 \times 2 = 1$

$342_{10} = 101010110_2$ ✓ (3)

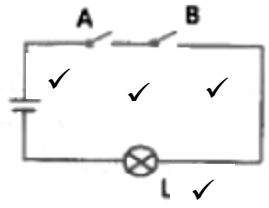
3.4
$$\begin{array}{r} 1\ 1\ 0 \\ +\ 1\ 0\ 1 \\ \hline 1\ 0\ 1\ 1\checkmark\checkmark \end{array}$$ (2)

3.5
$$\begin{array}{r} 1\ 0\ 0\ 1 \\ -1\ 1\ 0\ 1\ 0 \end{array}$$

$0\ 1\ 0\ 0\ 1 \rightarrow 0\ 1\ 0\ 0\ 1\checkmark$
$1\ 1\ 0\ 1\ 0 \rightarrow \overline{0\ 0\ 1\ 0\ 1}\checkmark$ one's complement
$\overline{0\ 1\ 1\ 1\ 0}\checkmark$ recomplement
$1\ 0\ 0\ 0\ 1\checkmark$ (4)

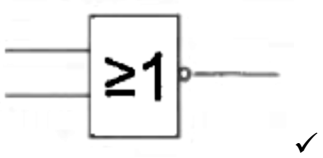
3.6 In an even parity, the total number of ones in the data plus the parity must be an even number.✓✓ (2)

3.7

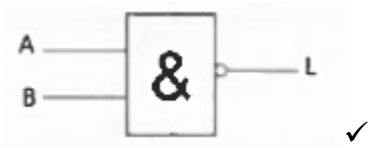


When both switches A and B are closed, the current flows✓ and the lamp is switched on.✓
When any one of the switches is open, the current does not flow✓ and the lamp switches off.✓ (8)

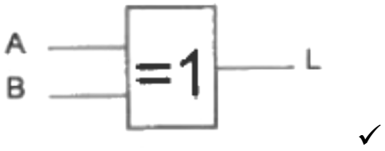
3.8 3.8.1



3.8.2



3.8.3

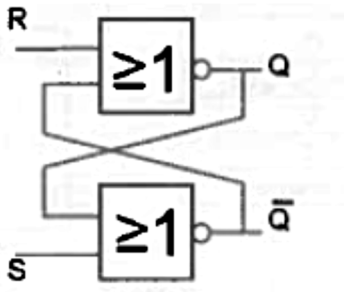


(3 × 1) (3)

3.9
- J-K
- S-R
- D
- T

(4)

3.10



(1 for each NOR gate + ½ for each input and output + 1 for correct circuit) (5)
[35]

QUESTION 4

4.1
- Operating system software
- Programming software
- Application software (3)

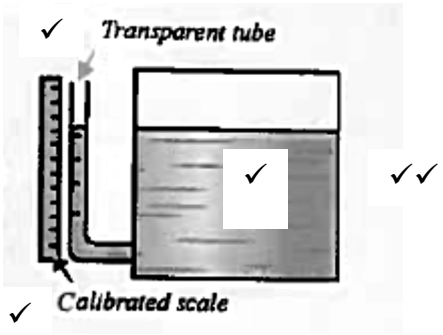
4.2
- Monitor
- Motherboard
- Central processing unit
- Random-access memory
- Serial and parallel ports
- Power supply unit
- Optical disk drive
- Keyboard
- Mouse (Any 3 × 1) (3)

4.3 Volatile memory is a computer memory that requires power to maintain the stored information,✓ i.e. RAM, flip-flop and semiconductor memories,✓ while nonvolatile memory is a computer memory that can retain the stored information even when the computer is switched off,✓ i.e. ROM, flash memory, CD and DVD.✓ (2 + 2) (4)

[10]

QUESTION 5

5.1



(5)

5.2 When a bimetal strip is heated✓, both metals begin to expand at their own rates of expansion.✓ One of the metals has a larger coefficient of expansion, so the strip bends when heated.✓In this transducer temperature is converted to a mechanical action.✓ (4)

5.3
- They are simple to operate.
- They are very reliable. (Any 1 × 1) (1)

[10]

TOTAL: 100

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