



higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

LOGIC SYSTEMS N3

8 August 2025

This marking guideline consists of 7 pages.

1.1 1.1.1 $1A_{16} = 11010_2 \checkmark$
 $5_{10} = 101_2 \checkmark$

$$5_{10} = 101_2 \checkmark$$

$$\begin{array}{r}
 \begin{array}{cccccc}
 & & 1 & 1 & 0 & 1 & 0 \\
 & X & & & 1 & 0 & 1 \\
 \hline
 & & 1 & 1 & 0 & 1 & 0 \\
 & 0 & 0 & 0 & 0 & 0 & \\
 & 1 & 1 & 0 & 1 & 0 & \\
 \hline
 1 & 0 & 0 & 0 & 0 & 0 & 1 & 0
 \end{array}
 \end{array}
 \begin{array}{l}
 \\
 \\
 \\
 \checkmark \\
 \\
 \checkmark
 \end{array}$$

$$10000010_2 = 202_8 \checkmark$$

1.1.2 $130_8 = 1011000_2 \checkmark$

[illegible]

$$1011_2 = B_{16} \checkmark$$

1.1.3 $100_{10} = 1100100_2 \checkmark$

$$5B_{16} = 1011011_2 \checkmark$$

$$\begin{array}{ccccccc} & 1 & 1 & 0 & 0 & 1 & 0 & 0 \\ - & 1 & 0 & 1 & 1 & 0 & 1 & 1 \\ \hline = & & & & 1 & 0 & 0 & 1 \end{array} \quad \begin{array}{l} \checkmark \\ \checkmark \end{array}$$

$$1001_2 = 9_{10} \checkmark$$

$$(3 \times 5) \quad (15)$$

1.2 $181_{10} = 10110101_2$ ✓

1's complement of $\begin{array}{r} 0\ 0\ 1\ 1\ 0\ 0\ 0\ 1 \\ = 1\ 1\ 0\ 0\ 1\ 1\ 1\ 0 \end{array}$ ✓

2's complement of $\begin{array}{r} = 1\ 1\ 0\ 0\ 1\ 1\ 1\ 0 \\ + 1 \\ \hline 1\ 1\ 0\ 0\ 1\ 1\ 1\ 1 \end{array}$ ✓

$\begin{array}{r} 1\ 0\ 1\ 1\ 0\ 1\ 0\ 1 \\ + 1\ 1\ 0\ 0\ 1\ 1\ 1\ 1 \\ \hline 1\ 1\ 0\ 0\ 0\ 0\ 1\ 0\ 0 \end{array}$ ✓

$1000100_2 = 132_{10}$ ✓ (1 is discarded)

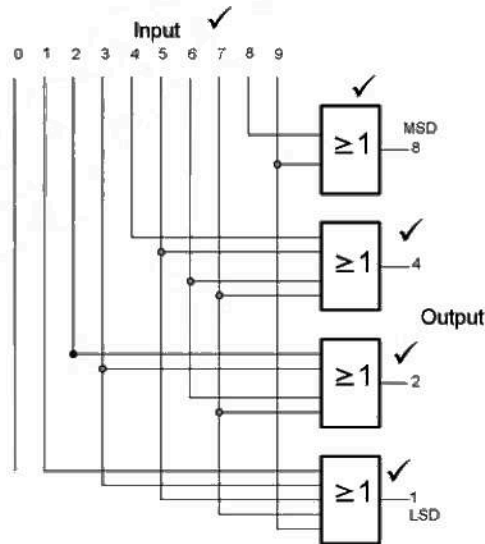
(5)
[20]

QUESTION 2

- 2.1 2.1.1 E
 2.1.2 D
 2.1.3 F
 2.1.4 A
 2.1.5 C

(5 × 1) (5)

2.2



(5)

2.3 2.3.1 101001011000_{XS3}

1010	0101	1000	
= 10	= 5	= 8	
10 - 3	5 - 3	8 - 3	
= 7	= 2	= 5	
✓	✓	✓	

$$101001011000_{XS3} = 725_{10}$$

2.3.2 $45_{10} = 101101_2$ ✓

$$\begin{array}{ccccccccccc} 1 & + & 0 & + & 1 & + & 1 & + & 0 & + & 1 & \checkmark \\ \downarrow & & & & & & & & & & & \\ 1 & & 1 & & 1 & & 0 & & 1 & & 1 & \checkmark \end{array}$$

$$45_2 = 111011_{\text{gray code}}$$

2.3.3

DECIMAL	4	2	2	1	
3	0	0	1	1	✓
6	1	1	0	0	✓
5	0	1	1	1	✓

$$365_{10} = 001111000111_{4221 \text{ BCD code}}$$

(3 × 3) (9)

2.4 Extended Binary Coded Decimal Interchange Code.

(1)
[20]

QUESTION 3

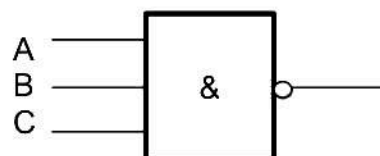
3.1 3.1.1 Complementary Metal Oxide Semiconductor
3.1.2 Transistor-Transistor Logic

(2 × 2) (4)

3.2 3.2.1 DTL NAND gate

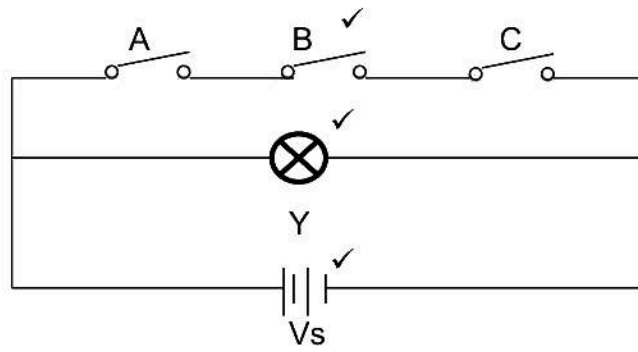
(2)

3.2.2



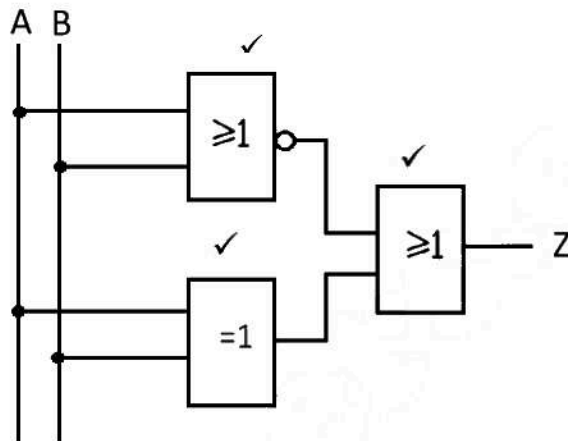
(2)

3.2.3



(3)

3.3



(3)

3.4

A	B	C	d	e	f	Z
0	0	0	0	0	0	0
0	0	1	0	0	0	0
0	1	0	0	1	0	1
0	1	1	0	0	1	1
1	0	0	0	0	0	0
1	0	1	0	0	0	0
1	1	0	1	1	0	1
1	1	1	1	0	1	1

✓ ✓ ✓ ✓

(4)

3.5 The output of an exclusive-OR gate will be a logic 1 only if one input is a logic 1.

(2)
[20]

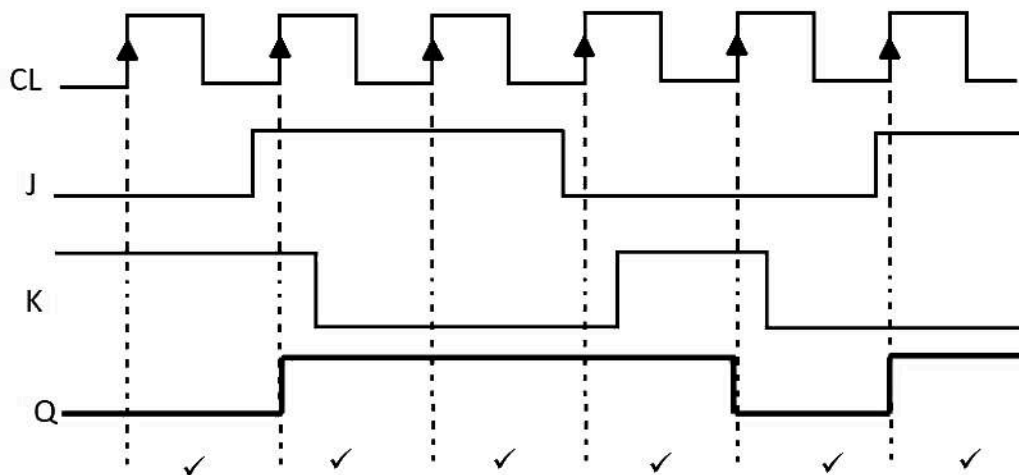
QUESTION 4

4.1

J	K	Q	$\bar{Q}$	comment	
0	0	Q	$\bar{Q}$	No change	✓
0	1	0	1	Reset	✓
1	0	1	0	Set	✓
1	1	$\bar{Q}$	Q	Toggle	✓

(4)

4.2



(6)

4.3

4.3.1 Electrically Erasable Programmable Read-Only Memory

4.3.2 Electrically Programmable Read-Only Memory

4.3.3 Dynamic Random Access Memory

(3 × 2)

(6)

4.4

- Bit density
- Speed
- Power consumption
- Convenience
- Storage cost

(Any 4 × 1)

(4)

[20]

QUESTION 5

5.1

- Frequency counters
- Digital clock
- Time measurement
- A to D converter
- Frequency divider circuits
- Digital triangular wave generator

(Any 4 × 1)

(4)

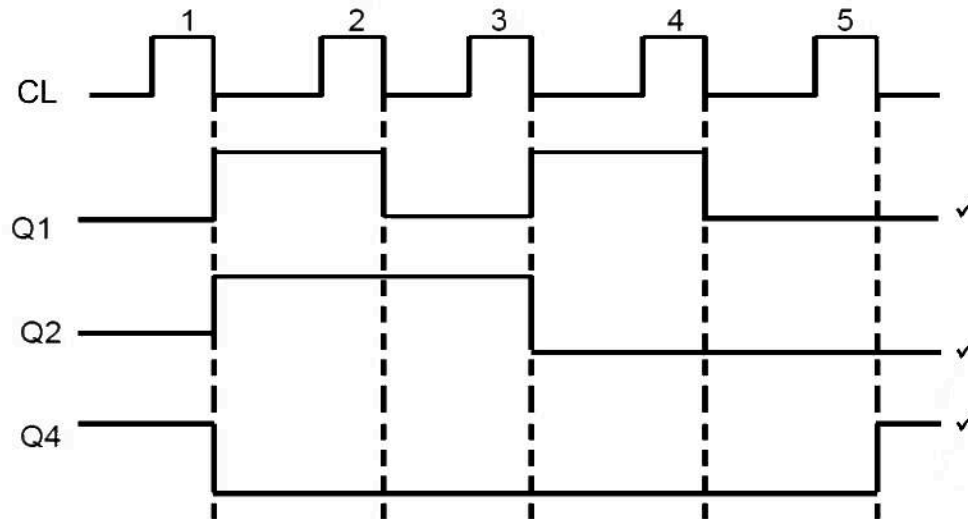
5.2

Clock pulse	Q4	Q2	Q1
0	1	0	0
1	0	1	1
2	0	1	0
3	0	0	1
4	0	0	0
5	1	0	0

✓

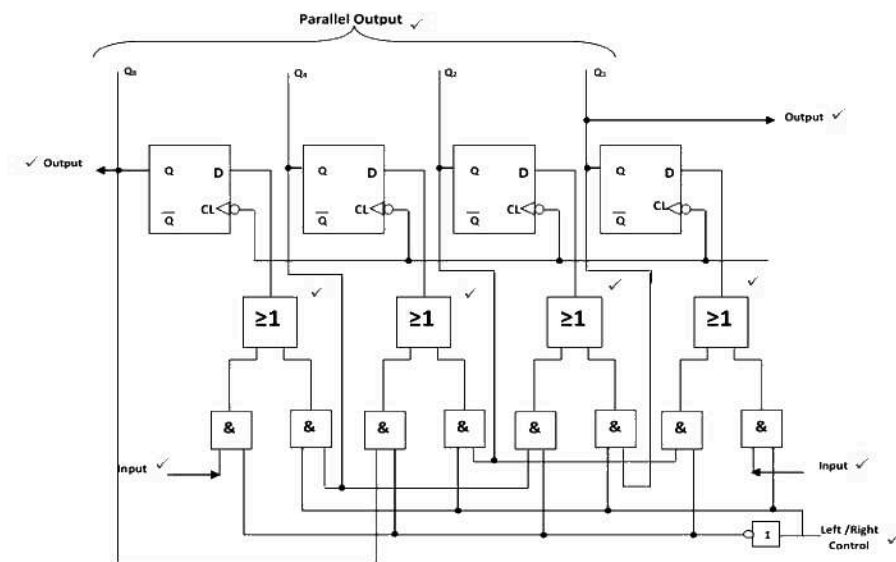
✓

✓



(6)

5.3



(10)
[20]

TOTAL: 100