



higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

LOGIC SYSTEMS N4

15 August 2025

This marking guideline consists of 8 pages.

✓ = 1 MARK ✓ = ½ MARK

QUESTION 1

1.1 0 ; 1 ; 2 ; 3 ; 4 ; 5 ; 6 ; 7 ✓ (1)

1.2 Transistor-Transistor Logic ✓ (1)

1.3 001100100₂ ✓ (1)

1.4

- More secure ✓
- More reliable ✓
- Easy to manipulate ✓

Alternate answers:

- Compatible with other digital systems
- Enables transmission of signals over long distance
- Enables multi-directional transmission simultaneously

 (3)

1.5 Two ✓ (1)

1.6 4 ✓ ✓ (2)

1.7 1.7.1 1 ✓

1.7.2 $\bar{A} + B$ ✓

1.7.3 A ✓

1.7.4 $A + B$ ✓

1.7.5 $\bar{A}$ ✓

(5 × 1) (5)

1.8.1

AB \ CD	00	01	11	10
00	1	1	0	1
01	1	0	0	1
11	1	0	0	1
10	1	1	1	1

$F = \bar{B} + \bar{D}$ ✓

1.8.2

CD \ AB	00	01	11	10
00	1	0	0	1
01	1	0	0	1
11	1	1	1	1
10	1	1	1	1

$$F = \bar{B} + C \quad \checkmark$$

1.8.3

CD \ AB	00	01	11	10
00	1	Ø	Ø	Ø
01	1	1	1	1
11	Ø	1	Ø	Ø
10	1	Ø	1	1

$$F = 1 \quad \checkmark$$

(3 × 2) (6)
[20]

QUESTION 2

2.1

2.1.1

$$3B, D_{16} = 00111011, 1101_2$$

$$36, 1_8 = 011110, 001_2$$

$$\begin{array}{r}
 \begin{array}{cccccccccc}
 1 & 1 & 1 & 0 & 1 & 1 & 1 & 1 & 0 & 1 \\
 0 & 1 & 1 & 1 & 1 & 0 & 0 & 0 & 1 & 0
 \end{array} \\
 \hline
 \begin{array}{cccccccccc}
 1 & 0 & 0 & 0 & 0 & 1 & 1 & 1 & 0 & 1 \\
 1 & 1 & 1 & 0 & 1 & 1 & 1 & 1 & 0 & 1 \\
 0 & 1 & 1 & 1 & 0 & 1 & 1 & 0 & 1 & 0
 \end{array} \\
 \hline
 \begin{array}{cccccccccc}
 & & & & & & & & + & 1 \\
 0 & 1 & 1 & 1 & 0 & 1 & 1 & 0 & 1 & 1
 \end{array} \\
 \hline
 = 3 \ 5, \ 5 \ 4_8 \quad \checkmark
 \end{array}$$

2.1.3 $147,5_{10} = 10010011,1_2$
 $2,3_8 = 10,011_2$

						1	1	1	0	1	1,	1	1	0	✓	
										1	0,	1	0	0	✓	
						1	1	1	0	1	1	1	0	0	0	✓
+		1	1	1	0	1	1	1	1	0	0	0	0	0	0	✓
		1	0	0	1	0	1,	0	1	1	0	0	0	0	0	✓
						=	2	2	5,	3 ₈	✓					

$$\begin{array}{r}
 1 \ 0 \ 0 \ 1 \ 1 \ 1 \quad \begin{array}{r}
 \begin{array}{r}
 1 \ 1 \ 1 \ 1 \ 1 \ 0, \ 0 \ 0 \ 0 \ 1 \ \checkmark \\
 \hline
 1 \ 0 \ 0 \ 1 \ 0 \ 0 \ 1 \ 1 \ 1 \ 0 \ 0, \ 0 \ 0 \ 0 \ 0 \ 0 \ \checkmark \\
 \hline
 - \ 1 \ 0 \ 0 \ 1 \ 1 \\
 \hline
 1 \ 0 \ 0 \ 0 \ 1 \ 1 \\
 \hline
 1 \ 0 \ 0 \ 1 \ 1 \\
 \hline
 1 \ 0 \ 0 \ 0 \ 0 \ 1 \ \checkmark \\
 \hline
 - \ 1 \ 0 \ 0 \ 1 \ 1 \\
 \hline
 1 \ 1 \ 1 \ 0 \ 1 \\
 \hline
 - \ 1 \ 0 \ 0 \ 1 \ 1 \\
 \hline
 1 \ 0 \ 1 \ 0 \ 0 \ \checkmark \\
 \hline
 - \ 1 \ 0 \ 0 \ 1 \ 1 \\
 \hline
 0 \ 0 \ 1 \ 0 \ 0 \ 0 \ 0 \\
 \hline
 - \ 1 \ 0 \ 0 \ 1 \ 1 \ \checkmark
 \end{array}
 \end{array} \\
 \hline
 = 3 \ E, \ 1_{16} \ \checkmark
 \end{array}$$

$$(3 \times 6) \quad (18)$$

2.2 American Standard Code for Information Interchange✓✓ (2)

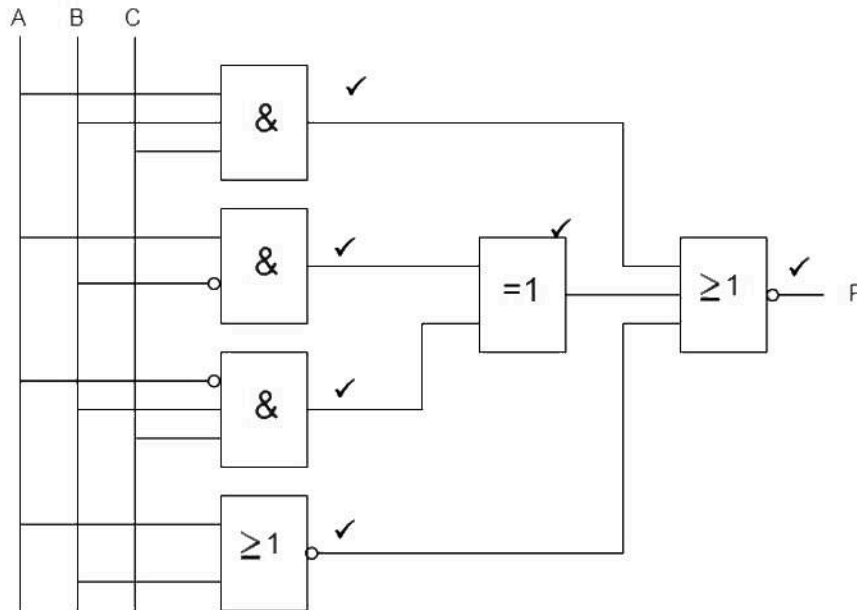
2.3

{	-	111	1011	✓
L	-	100	1100	✓
f	-	110	0110	✓
8	-	011	1000	✓
^	-	101	1110	✓

(5)
[25]

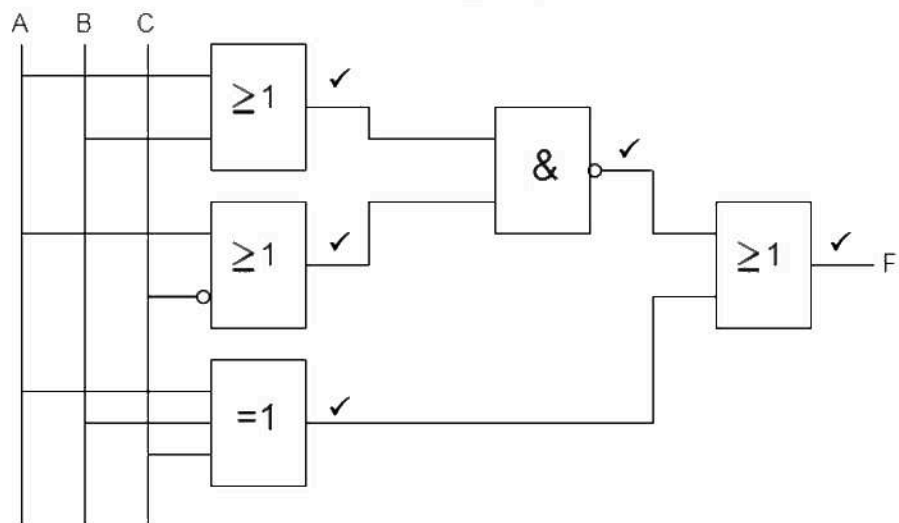
QUESTION 3

3.1 3.1.1



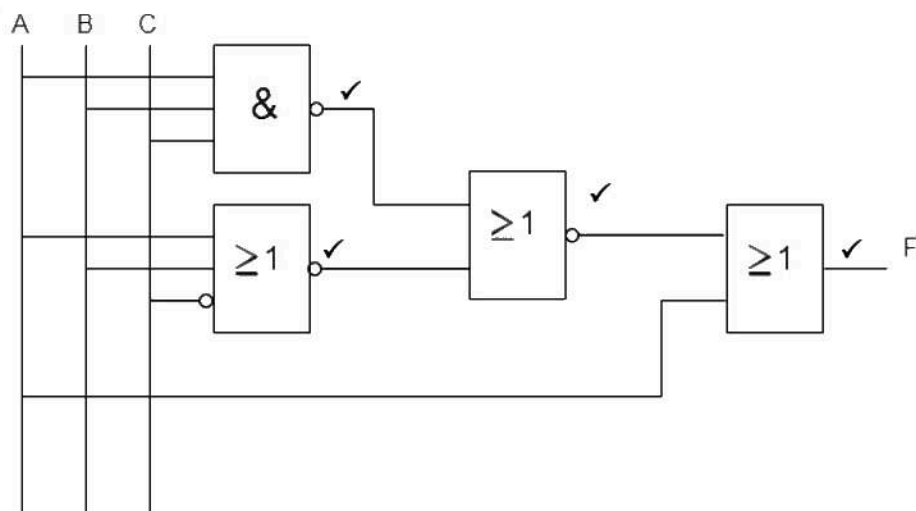
(6)

3.1.2



(5)

3.1.3



3.2 3.2.1 $F = \overline{C+D} + \overline{A}C\overline{D} + A\overline{B}C + AC\overline{D}$
 $= \overline{C}\overline{D} + \overline{A}C\overline{D} + A\overline{B}C + AC\overline{D}$ ✓
 $= \overline{C}\overline{D} + C\overline{D}(\overline{A}+A) + A\overline{B}C$ ✓
 $= \overline{C}\overline{D} + C\overline{D} + A\overline{B}C$ ✓
 $= \overline{D}(\overline{C}+C) + A\overline{B}C$ ✓
 $= \overline{D} + A\overline{B}C$ ✓

3.2.2 $F = \overline{A\overline{B}} + \overline{A\overline{B}}(A+B)$
 $= \overline{A\overline{B}} \cdot \overline{A\overline{B}}(A+B)$ ✓
 $= (\overline{A}+B) \cdot (\overline{A}+B)(A+B)$ ✓
 $= (\overline{A}+B)(A\overline{A}+AB+A\overline{B}+\overline{B}B)$ ✓
 $= (\overline{A}+B)(A+AB+A\overline{B})$ ✓
 $= (\overline{A}+B)[A+(1+B+\overline{B})]$ ✓
 $= (\overline{A}+B)A$ ✓
 $= A\overline{A}+AB$
 $= AB$ ✓

(2 × 5) (10)
 [25]

QUESTION 4

Input (Gray code)				Output (Binary)			
A	B	C	D	W	X	Y	Z
0	0	0	0	0	0	0	0
0	0	0	1	0	0	0	1
0	0	1	0	0	0	1	1
0	0	1	1	0	0	1	0
0	1	0	0	0	1	1	1
0	1	0	1	0	1	1	0
0	1	1	0	0	1	0	0
0	1	1	1	0	1	0	1
1	0	0	0	1	1	1	1
1	0	0	1	1	1	1	0
1	0	1	0	1	1	0	0
1	0	1	1	1	1	0	1
1	1	0	0	1	0	0	0
1	1	0	1	1	0	0	1
1	1	1	0	1	0	1	1
1	1	1	1	1	0	1	0
✓	✓	✓	✓	✓	✓	✓	✓

CD \ AB	00	01	11	10
00			1	1
01			1	1
11			1	1
10			1	1

✓

$$W = A \quad \checkmark$$

CD \ AB	00	01	11	10
00		1		1
01		1		1
11		1		1
10		1		1

✓

$$X = \bar{A}B + A\bar{B} = A \oplus B \quad \checkmark$$

CD \ AB	00	01	11	10
00		1		1
01		1		1
11	1		1	
10	1		1	

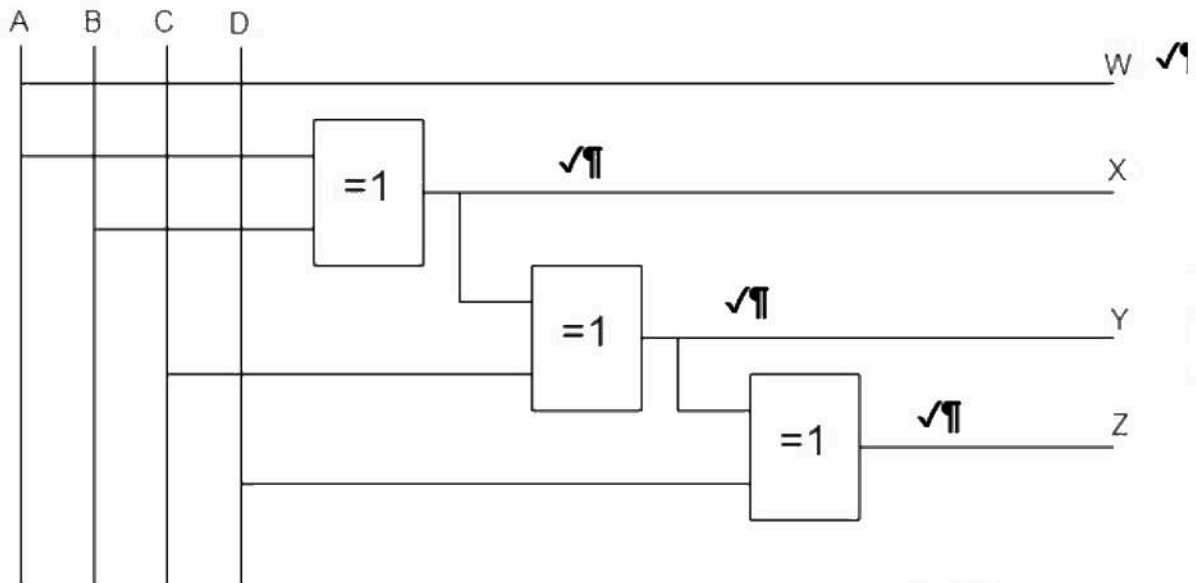
✓

$$Y = A \oplus B \oplus C \quad \checkmark$$

CD \ AB	00	01	11	10
00		1		1
01	1		1	
11		1		1
10	1		1	

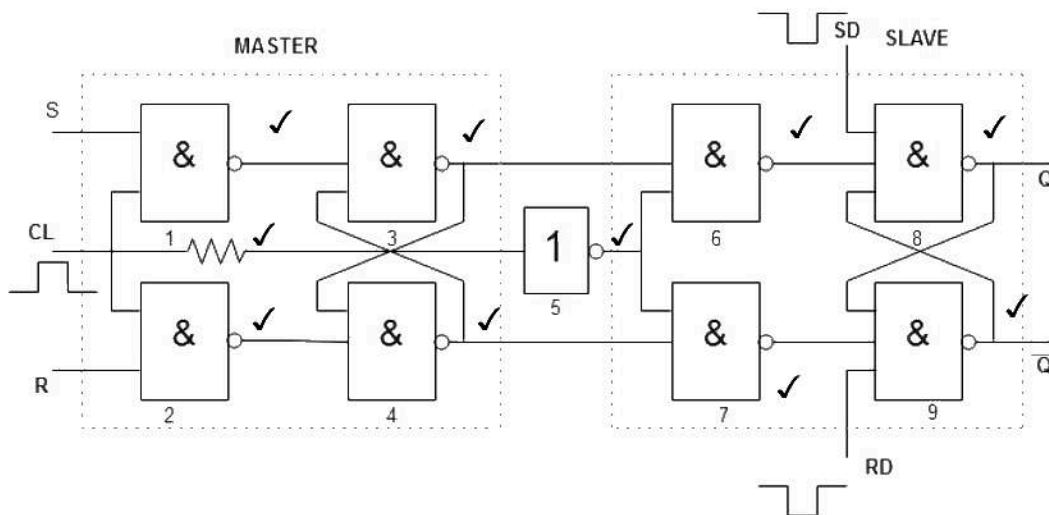
✓

$$Z = A \oplus B \oplus C \oplus D \quad \checkmark$$



[20]

QUESTION 5



[10]

TOTAL: 100