higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

LOGIC SYSTEMS N2

6 April 2020

This marking guideline consists of 6 pages.

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QUESTION 1

1.1 1.1.1 C
1.1.2 E
1.1.3 D
1.1.4 A
1.1.5 H
1.1.6 I

(6 × 1) (6)

1.2 X = 17_{10}; Y = 23_{10} and Z = 9_{10}

Code	16	8	4	2	1
17 =	**1**	**0**	**0**	**0**	**1**

✓

Code	16	8	4	2	1
23 =	**1**	**0**	**1**	**1**	**1**

✓

Code	8	4	2	1
9 =	**1**	**0**	**0**	**1**

✓

(3)

1.2.1

$$\begin{array}{r} 10001 \\ +\ 10111 \\ \hline 101000_2 \end{array}$$ ✓

$1\ 0\ 1\ 0\ 0\ 0_2 = 2^5 + 2^3$ ✓
$= 32 + 8$
$= 40_{10}$ ✓ (3)

1.2.2

$$\begin{array}{r} 10111 \\ -\ \ 1001 \\ \hline \ \ 1110_2 \end{array}$$ ✓

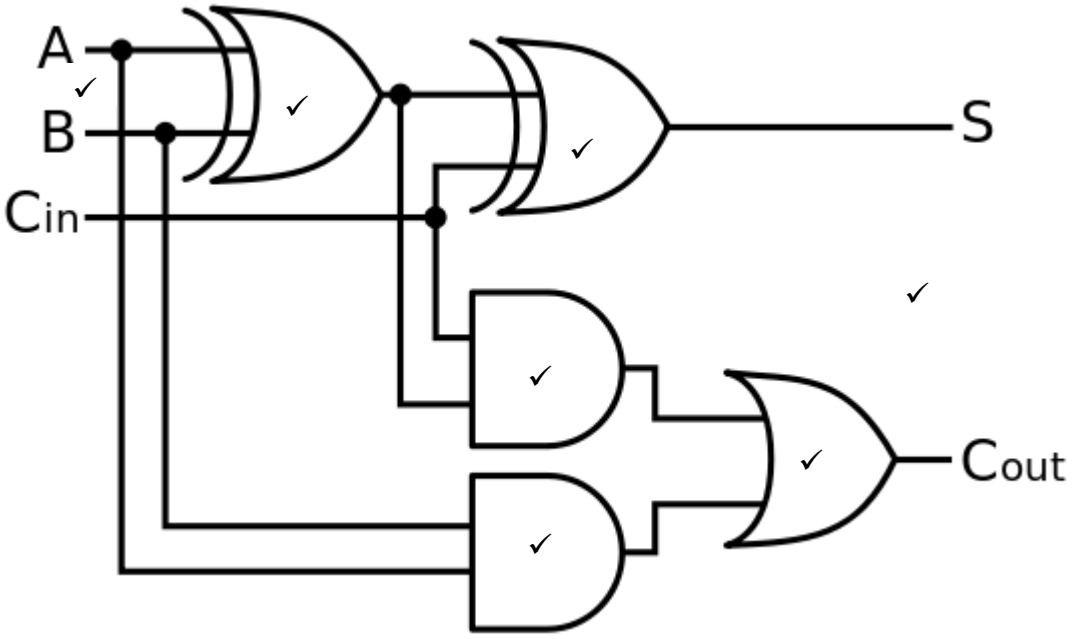
$1\ 1\ 1\ 0_2 = 2^3 + 2^2 + 2^1$ ✓
$= 8 + 4 + 2$
$= 14_{10}$ ✓ (3)

1.2.3

$$\begin{array}{r} 10001 \\ \times\ \ 1001 \\ \hline 10001 \\ 1001000 \\ \hline 1011001_2 \end{array}$$ ✓ ✓

$1\ 0\ 1\ 1\ 0\ 0\ 1_2 = 2^6 + 2^4 + 2^3 + 2^0$
$= 64 + 16 + 8 + 1$
$= 89_{10}$ ✓ (3)

1.3



(7)
[25]

QUESTION 2

2.1 2.1.1 Represented
2.1.2 Security

(2 × 1) (2)

2.2
- 8421 code
- 2421 BCD code

(Any correct answer) (2 × 1) (2)

2.3 2.3.1

5	3	1
7421	7421	7421
0101 ✓	0011 ✓	0001 ✓

$531 = 010100110001_{7421BCD}$

2.3.2

1010	0101	1000
-0011	-0011	-0011
0111	0010	0101
8421	8421	8421
7 ✓	2 ✓	5 ✓

$725 = 101001011000_{XS3CODE}$

2.3.3

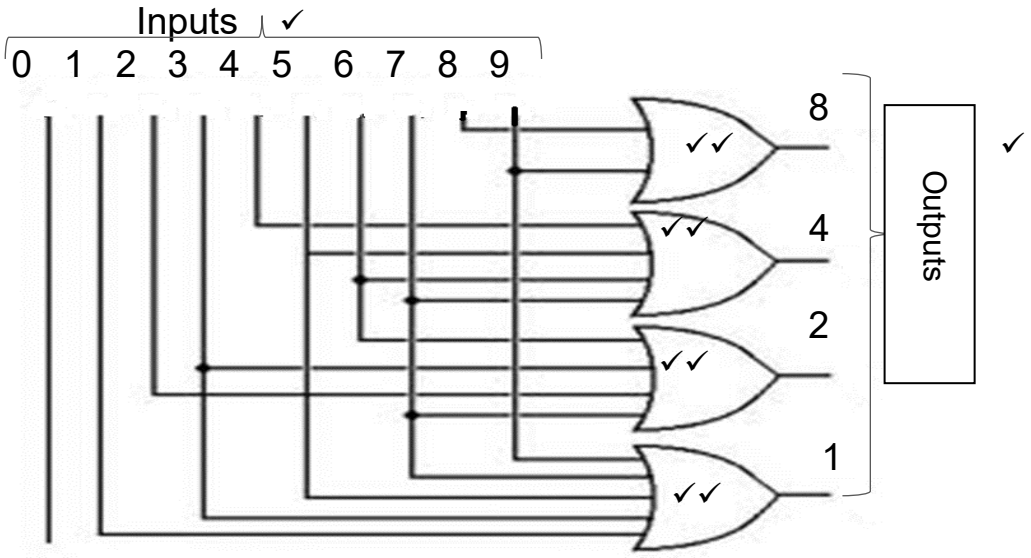
0011	1100	1111
2421	2421	2421
3 ✓	6 ✓	9 ✓

001111001111 2421BCD = 683_{10}

(3 × 3) (9)

2.4 It is because the binary digits are representing a binary code and not a binary number. (2)

2.5



(10)
[25]

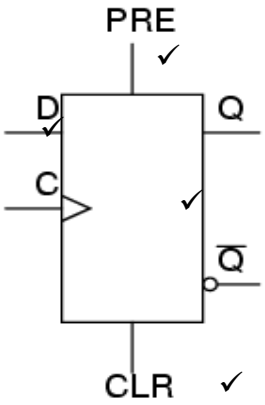
QUESTION 3

3.1 3.1.1 When the pre-set input is active (i.e. logic 1), the output of the flip-flop is forced to logic 1 immediately.

3.1.2 When the clear signal is active (i.e. logic 0), the output of the flip-flop is forced to logic 0 immediately.

(2 × 2) (4)

3.2



(4)

3.3 3.3.1 NOR gate (2)

3.3.2 8 (1)

3.3.3

A	B	C	D	E	Q	
0	0	0	1	0	1	✓
0	0	1	1	0	1	✓
0	1	0	0	0	0	✓
0	1	1	0	1	1	✓
1	0	0	0	0	0	✓
1	0	1	0	0	0	✓
1	1	0	0	0	0	✓
1	1	1	0	1	1	✓

(9)

3.4
- Speed
- Capacity
- Cost
- Convenience/Inconvenience
- Type of memory

(5)
[25]

QUESTION 4

4.1 4.1.1 D✓
In a Johnson counter the number of states is determined by 2N, therefore 2 × 4 = 8.✓✓

4.1.2 D✓
Series-in/series-out register would have a complete binary number shifted in one bit at a time and have all the stored bits shifted out one at a time.✓✓

4.1.3 B✓
Parallel-in/parallel-out gives the same output as input.✓✓

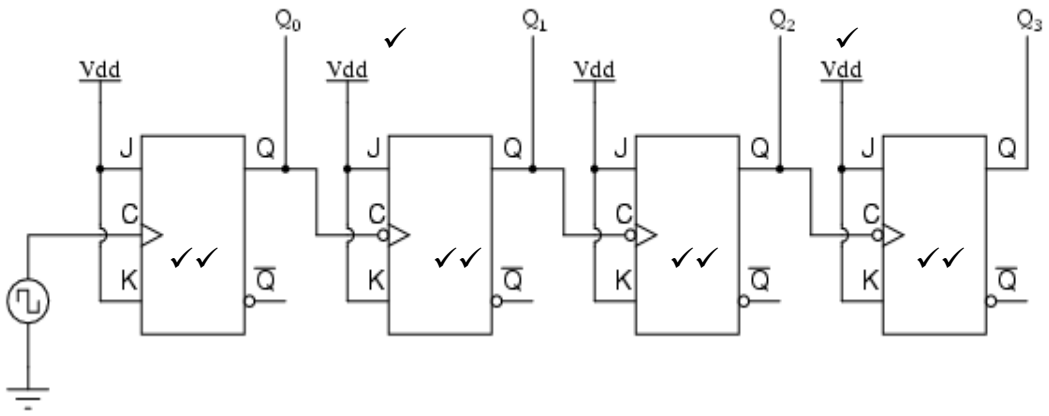
4.1.4 A✓
When two or more outputs are connected to the same input, a tristate buffer is always used because it has the capability to take up to three inputs.✓✓

4.1.5 A✓
A recirculating register is a register of which the serial output is connected to the serial input in a circulated manner.✓✓

(5 × 3) (15)

4.2

Four-bit JK up counter



(10)
[25]

TOTAL: 100

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