higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

AUGUST EXAMINATION

LOGIC SYSTEMS N3

29 JULY 2014

This marking guideline consists of 6 pages.

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SECTION A

QUESTION 1

1.1	1.1.1	A
	1.1.2	B
	1.1.3	A
	1.1.4	C
	1.1.5	D
	1.1.6	D
	1.1.7	C
	1.1.8	D
	1.1.9	C
	1.1.10	C

(10 × 1) (10)

1.2	1.2.1	True
	1.2.2	True
	1.2.3	False
	1.2.4	False
	1.2.5	False
	1.2.6	False
	1.2.7	True
	1.2.8	True
	1.2.9	False
	1.2.10	True

(10 × 1) (10)

1.3	1.3.1	D
	1.3.2	E
	1.3.3	A
	1.3.4	C
	1.3.5	B

(5 × 1) (5)
[25]

TOTAL SECTION A: 25

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SECTION B

QUESTION 2

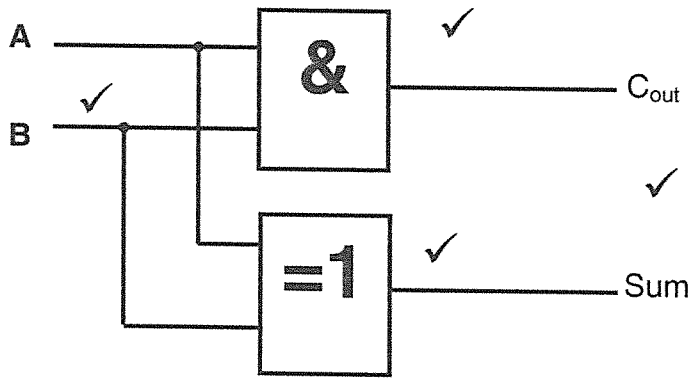
2.1 2.1.1 Figure 1 (a) is an half adder ✓
Figure 1 (b) is an half subtractor ✓ (2)

2.1.2

Inputs		Outputs✓	
A	B	Dif✓	B_{out} ✓
0	0	0	0
0	1	1	1
1	0	1	0
1	1	0	0

(3)

2.1.3



(4)

2.2 $4+3 = 7$ ✓ $\rightarrow 0111_{EX3}$ ✓ (2)

2.3 $63_{10} - 100_{10}$

9's complement of 100 is $999 - 100 = 899$ ✓

$$\begin{array}{rrrrrr} & 1 & * & 8 & 9 & 9 \\ & 0 & * & & 6 & 3 \\ \hline & 1 & * & 9 & 6 & 2 \end{array}$$ ✓

Complement 1* 962 to $-(999 - 962) = -37_{10}$ ✓

(3)

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2.4 $1010_2 \times 20_8$

2	0
010	000

$\therefore 20_8 = 10000_2$✓

			1	0	0	0	0
				1	0	1	0
			0	0	0	0	0
		1	0	0	0	0	
	0	0	0	0	0		✓
1	0	0	0	0			
1	0	1	0	0	0	0	0✓

$\therefore 1010\ 0000_2 = A0_{16}$ ✓ (4)

2.5 $30_{16} \div 12_{10}$

3	0
0011	0000

$\therefore 30_{16} = 110000_2$✓

2^3	2^2	2^1	2^0
8	**4**	**2**	**1**
1	1	0	0

$\therefore 12_{10} = 1100_2$✓

							1	0	0✓	
1	1	0	0	1	1	0	0	0	0	
				1	1	0	0			
				0	0	0	0	0		✓
				0	0	0	0			
					0	0	0	0	0	
						0	0	0	0	

Answer: $100_2 = 4_8$✓ (5)

2.6

1	0	1	1	1	**0**	1	1	e	
1	0	0	0	1	**0**	1	1	e	
1	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**u**	✓
1	0	1	0	1	**1**	0	0	e	✓
1	0	0	0	0	**1**	1	1	e	
1	1	1	1	1	**1**	1	1	e	
e	e	e	e	e	**u**	e	e		
				✓✓					

1	0	1	1	1	0	1	1	
1	0	0	0	1	0	1	1	
1	1	1	0	0	**1**	0	0	✓✓
1	0	1	0	1	1	0	0	
1	0	0	0	0	1	1	1	
1	1	1	1	1	1	1	1	

Corrected

Fault is on column 6 and row 3, and zero should be changed to one (1). ✓

(7)
[30]

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QUESTION 3

3.1 3.1.1

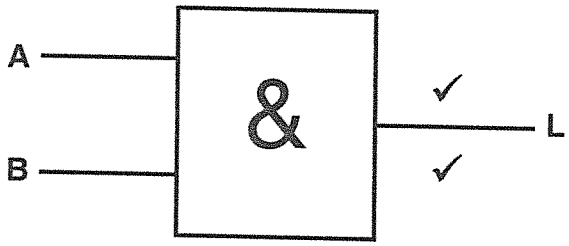
A	B		L
0	O		**0**
1	0		**0**
0	1		**0**
1	1		**1**

✓ ✓ ✓

(3)

3.1.2 AND function ✓✓ (2)

3.1.3



✓ ✓

(2)

3.2 NOT gate is called inverter because its output is the inverse of the input. ✓✓ (2)

3.3 3.3.1 Large Scale Integration ✓✓

3.3.2 Complementary Metal Oxide Semiconductor ✓✓

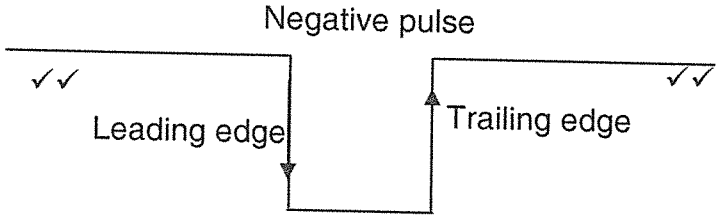
3.3.3 Emitter Coupled Logic ✓✓

(3 × 2) (6)

[15]

QUESTION 4

4.1



(4)

4.2
- Speed✓
- Storage cost✓
- Bit density✓
- Power required✓
- Convenience or inconvenience✓

(5)

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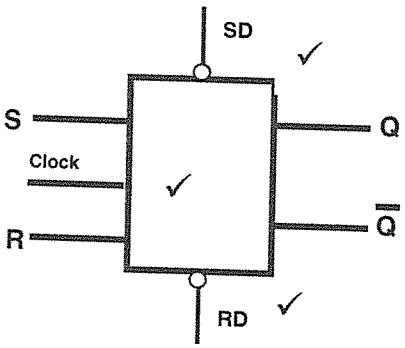
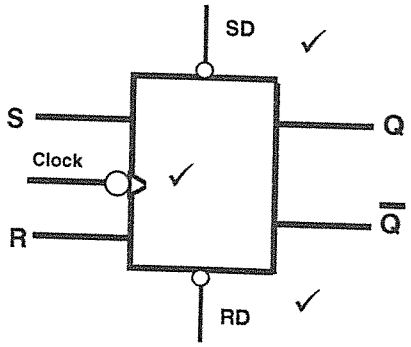
4.3



Clocked RS flip-flop



RS master/slave flip-flop

(6)
[15]

QUESTION 5

5.1 5.1.1 Up-counter is simply a digital counter which counts up at some predefined increment. ✓✓

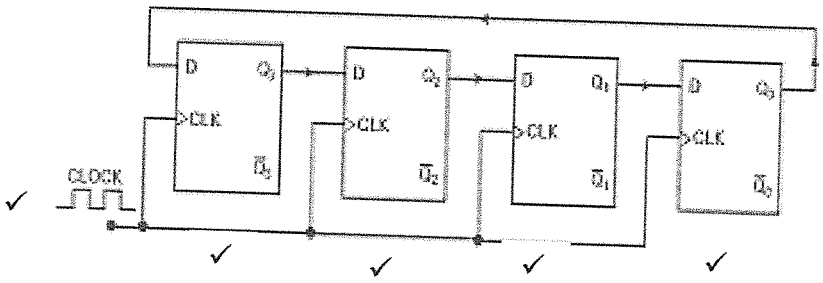
5.1.2 Up/down is a counter that can change state in either direction, under the control of an up/down selector input. ✓✓

5.1.3 Ripple counter consists of a series connection of complementing flip-flops and the output of each flip-flop is connected to the clock input of the next higher-order flip-flop. ✓✓

(3 × 2) (6)

5.2 5.2.1 It is called twisted ring counter because the inverted output of the last flip-flop is connected to the input of the first flip-flop. ✓✓ (2)

5.2.2



(5)

5.3 Five flip-flops✓✓

(2)
[15]

TOTAL SECTION B: 75
GRAND TOTAL: 100

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