higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

LOGIC SYSTEMS N4

2 AUGUST 2018

This marking guideline consists of 6 pages.

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QUESTION 1

1.1
- Fetching instructions
- Encoding the instructions into commands
- Executing commands
- Storing and writing the results to memory (4)

1.2 8 (1)

1.3 1110011 Gray number = 1011101_2 (1)

1.4 Parity bit is added to check that the data sent and the data received have not been altered during transmission. (2)

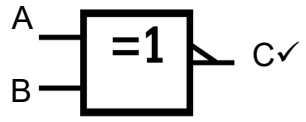
1.5
1.5.1 1
1.5.2 1
1.5.3 $\overline{B}$
1.5.4 1

(4 × 1) (4)

1.6 1.6.1

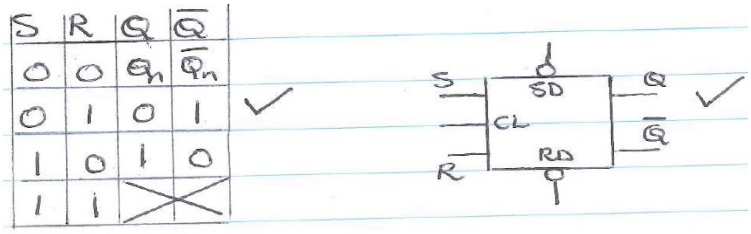
A	B	C
0	0	1
0	1	0
1	0	0
1	1	1

✓



$C = \overline{A \oplus B}$✓ (3)

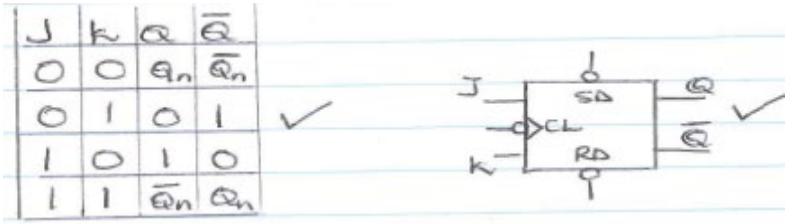
1.7 1.7.1



1.7.2



1.7.3



(3 × 2) (6)
[21]

QUESTION 2

2.1 2.1.1 $2C,5_{16} - 6,25_{10}$

$101100,0101_{2}$✓✓ $101100,0101$
$-000110,0100_{2}$✓ → $+111001,1100$✓
1 $100110,0001$
→ Ignore Carry✓

$100110,0001 = 100110,0001_{2}$✓
$= 1$ ✓$2^{5} + 0 \times 2^{2} + 1 \times 2^{1} + 1 \times 2^{-4}$
$= 18,0625_{10}$✓

2.1.2 $12,125_{10} \times 5,4_{8}$

$1100,001_{2}$✓ $101,1_{2}$✓

1100001
$\times \quad 1011$
1100001
1100001 ✓
$+ \quad 1100001$
$1000010,1011_{2}$✓

$1000010,1011_{2} = 0100 \ 0010, \ 1011$✓
$8421 \ 8421 \ 8421$
$= 42,B_{16}$ ✓

2.1.3 $B_{16} \div 4_{8}$
1011_{2}✓ ÷ 100_{2}✓

$10,11_{2}$✓
$100 \overline{)\ 101100}$
-100
110
-100 ✓
100
-100
0

$10,11_{2} = 010 \ , \ 110$✓
$421 \ 421$
$= 2,6_{8}$✓

(3 × 6) (18)

2.2 2.2.1 8 , 6 5
8 421 8 421 8 421
1000✓ 0110,✓ 0101 8421BCD✓

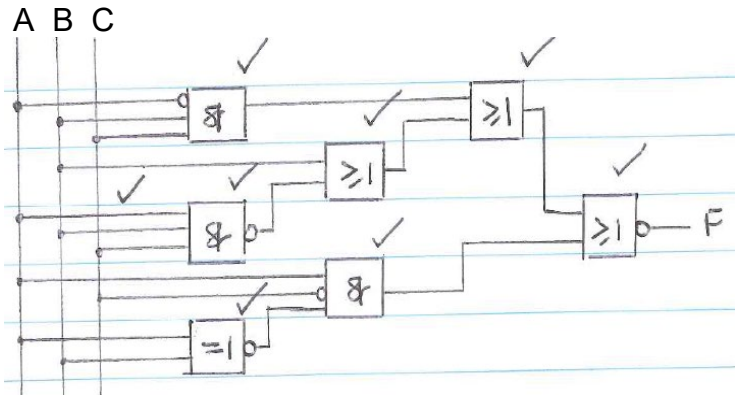
2.2.2 8 ,6 5
\+ 3 +3 +3
8421 8421 8421
1011✓ 1001, ✓ 1 000 XS3 Code✓

2.2.3 8 ,6 5
2421 2421 2421
1110✓ 1100,✓ 1011 2421BCD✓
(3 x 3) (9)

2.3 B = 11 00 0010✓✓
i = 10 00 1001✓✓
g = 10 00 0111✓✓ (6)
[33]

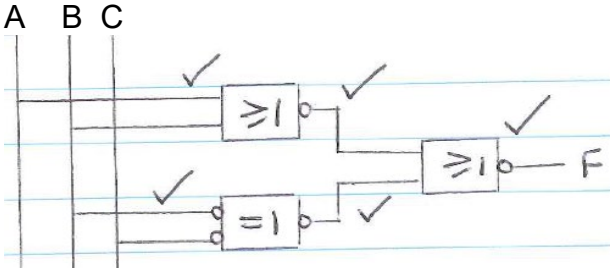
QUESTION 3

3.1 3.1.1



(8)

3.1.2



(5)

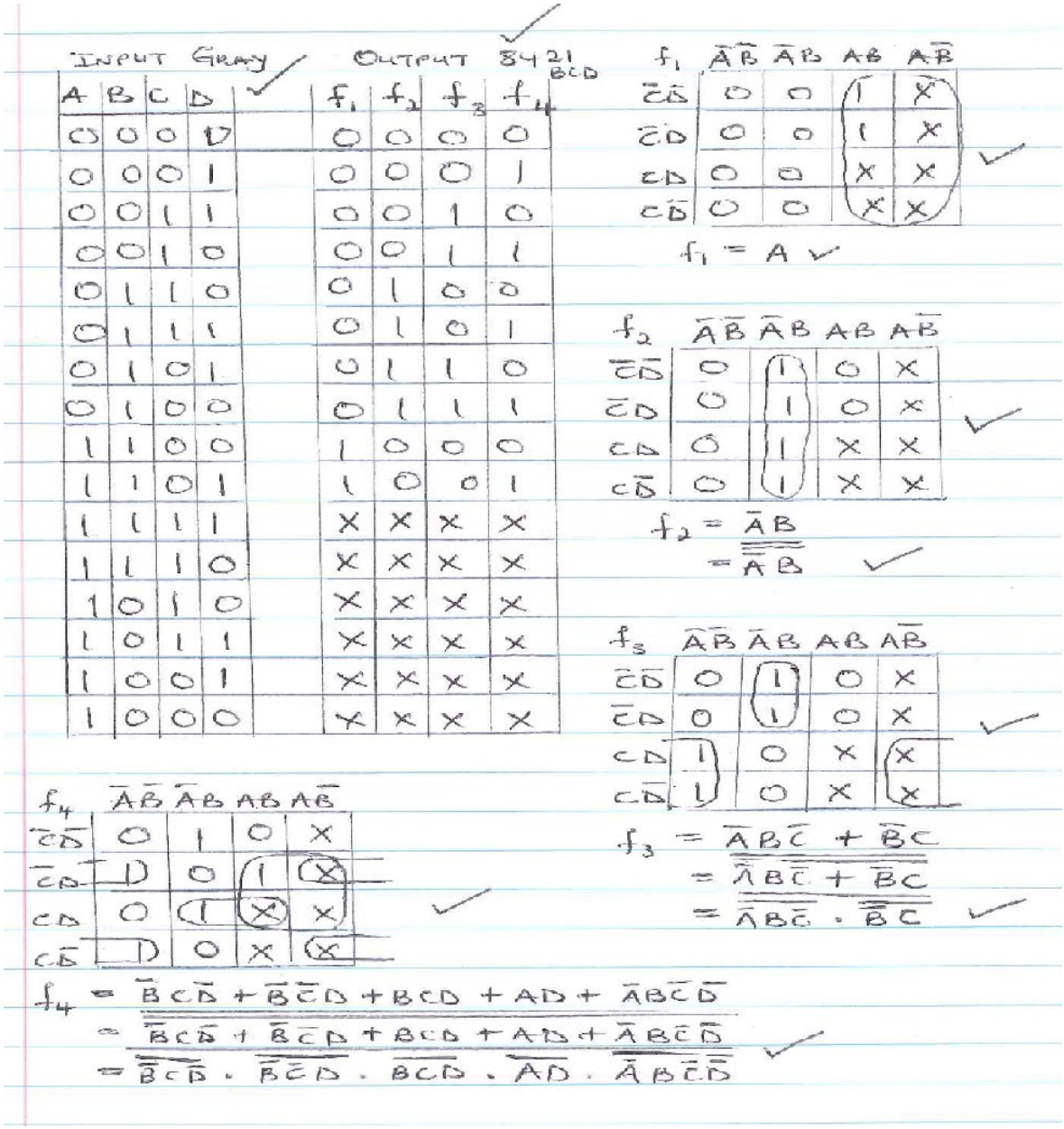
3.2 3.2.1

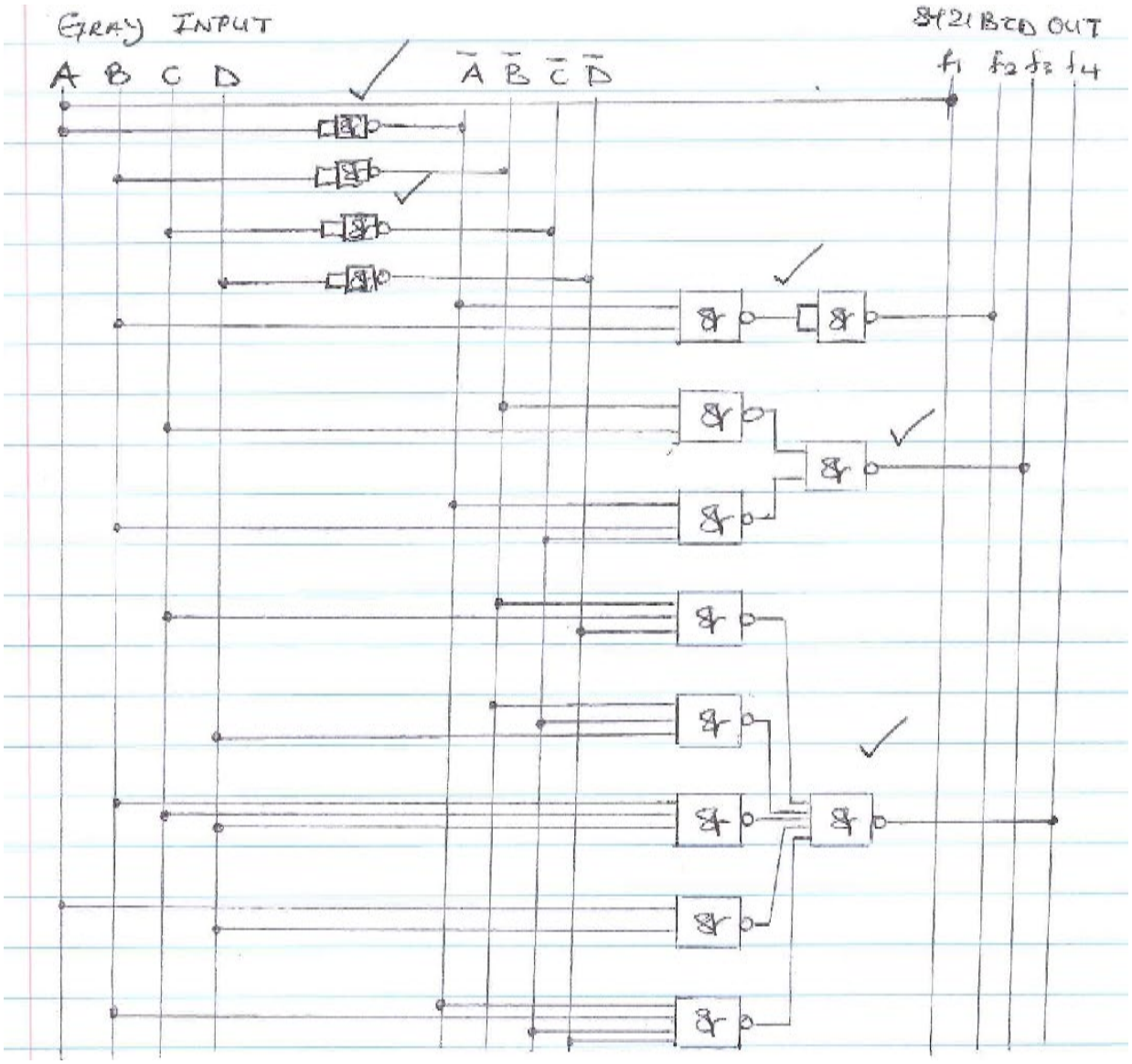
$$F = AB + \overline{\overline{A}B\overline{C} + A\overline{B} + \overline{A}C}$$
$$= AB + (\overline{\overline{A}B\overline{C}}).(\overline{A\overline{B}}).\overline{\overline{A}C}\checkmark$$
$$= AB + (\overline{\overline{A}} + \overline{B} + \overline{\overline{C}})(\overline{A} + \overline{\overline{B}})(\overline{\overline{A}} + \bar{C})\checkmark$$
$$= AB + (A + \overline{B} + C)(\overline{A} + B)(A + \overline{C})\checkmark$$
$$= AB + (0 + AB + \overline{AB} + 0 + \overline{A}C + BC)(A + \overline{C})\checkmark$$
$$= AB + AB + 0 + 0 + ABC + AB\overline{C} + \overline{ABC} + 0 + 0\checkmark$$
$$= AB + \overline{ABC}\checkmark$$

3.2.2 $F = A(A + B + C)(\overline{B} + \overline{C})(\overline{A} + B + C)$
$= (A + AB + AC)(\overline{B} + \overline{C})(\overline{A} + B + C)$
$= A(\overline{B} + \overline{C})(\overline{A} + B + C)$✓
$= (A\overline{B} + A\overline{C})(\overline{A} + B + C)$✓
$= 0 + 0 + A\overline{B}C + 0 + AB\overline{C} + 0$✓
$= A\overline{B}C + AB\overline{C}$✓
$= A(\overline{B}C + B\overline{C})$✓
$= A(B \oplus C)$✓

(2 × 6) (12)
[25]

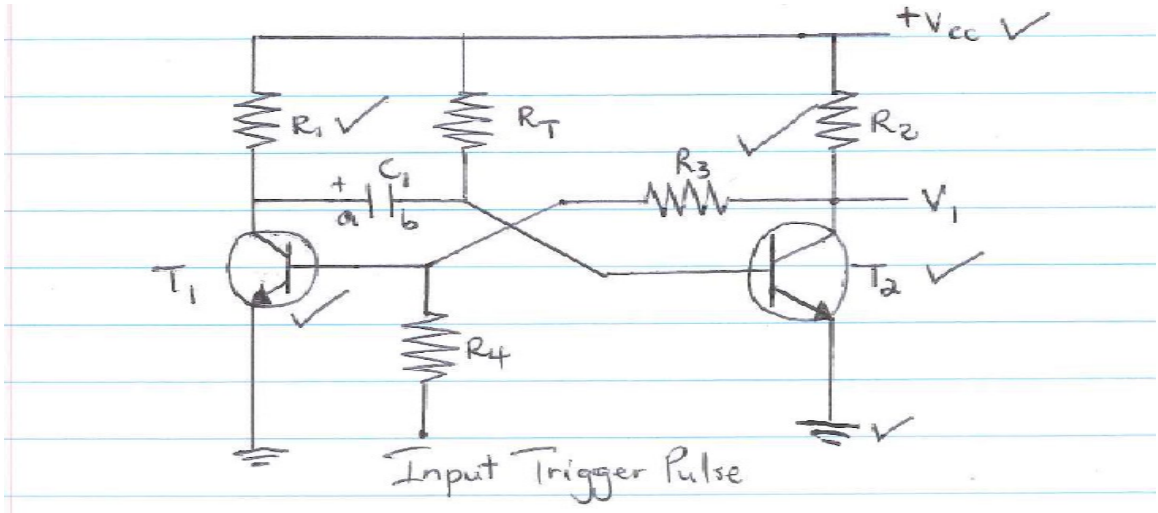
QUESTION 4





[15]

QUESTION 5



[6]

TOTAL: 100

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