higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

APRIL EXAMINATION

LOGIC SYSTEMS N4

5 APRIL 2013

This marking guideline consists of 7 pages.

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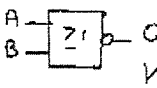
QUESTION 1

1.1 0,1 ✓

1.2 B ✓

1.3 $\overline{A+B} = \bar{A}\,\bar{B}$ ✓

$\bar{A}+\bar{B} = \overline{A \cdot B}$ ✓

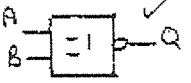
1.4 

✓ ✓

A	B	Q
0	0	1
0	1	1
1	0	1
1	1	0

✓ $Q = \overline{A+B}$ ✓

1.5 Groups as large as possible. ✓
Group the one's together. ✓
Groups MAY overlap ✓
Group horizontal and/or Vertical. ✓
Use as few groups as possible. ✓

1.6. 

✓

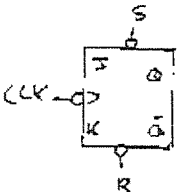
A	B	Q
0	0	1
0	1	0
1	0	0
1	1	1

✓ $Q = \overline{A \oplus B}$ ✓

1.7.

1.7.1 A ✓ ✓

1.7.2 1

1.8. 

✓

J	K	Q	Q̄
0	0	No change	
0	1	0	1
1	0	1	0
1	1	TOGGLE.	

✓ ✓

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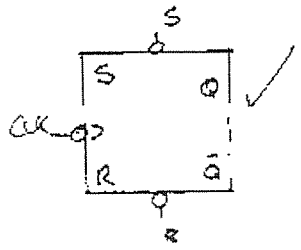
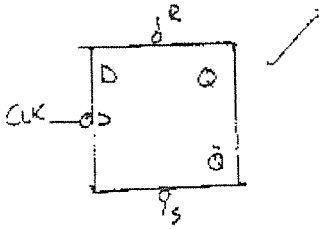
2.



S	R	Q	Q̄
0	0	UNCHANGED	
0	1	0	1
1	0	1	0
1	1	UNDEFINED.	



D	Q	Q̄
0	0	1
1	1	0

(26)

QUESTION 2.

2.1. $15,6_8 - 17,25_{10}$

$15,6_8 = 1\,101,110_2 \longrightarrow 0^{*}\,001\,101,11$

$17,25_{10} = 10001,01_2$. 1's Comp $\quad 1^{*}\,110\,110,10$

$1^{*}\,111\,100,01 = 11,1_2$

$= \underline{-3,5_{10}}$ (6)

No Carry.
1's compl. for answ.
Sign negative.

2.2. $E,5_{16} \times 2,375_{10}$

$E,5_{16} = 1110,0101_2$

$2,375_{10} = 10,011_2$

$$\begin{array}{r} 1110,0101 \\ \times\ 10,011 \\ \hline 1110,0101 \\ 1110\,0101\,0 \\ 1110\,0101\,00000 \\ \hline 100001,1111111 \end{array}$$

(6)

$= \underline{21,FE_{16}}$

3.

2.3 $A,C_{16} \div 2,3_8$

$A,C_{16} = 1010,1100_2$ ✓

$2,3_8 = 10,011_2$ ✓

$10011 \overline{)1010110,0000}$ ✓

100,1000 ✓

10011 ✓

00010100 ✓

10011 ✓

00001000 ✓

$100,1000_2 = 4,4_8$ ✓ (6)

2.4.

1	2	3	4	5	6	7
P1	P2	D1	P3	D2	D3	D4
0	0	1	1	0	1	

✓

$P_1 = 1, 3, 5, 7 \times 1$ ✓

$P_2 = 2, 3, 6, 7$ ✓ 0 ✓

$P_3 = 4, 5, 6, 7 \times 1$ ✓

$101_2 = 5_{10}$ ✓

bit 5 wrong.

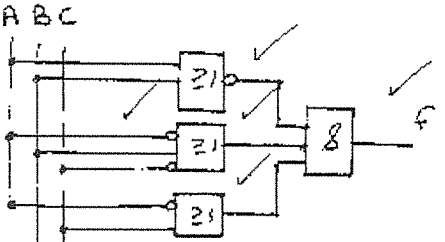
Corrected = $0011001_{HAMM.}$ ✓ (6)

ORIGINAL DATA = 1001_2.

QUESTION 3

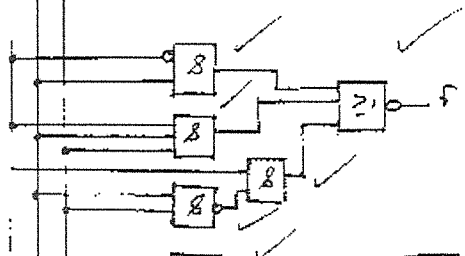
3.1 A B C

3.1.1.



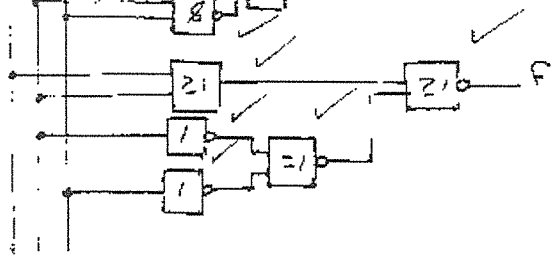
(5)

3.1.2



(5)

3.1.3



(5)

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4.

3.2 $A(A+B+C)(\bar{B}+\bar{C})(\bar{A}+B+C) = F$

$= (A + AB + AC)(\bar{B}+\bar{C})(\bar{A}+B+C)$ ✓

3.2.1 $= A(\bar{B}+\bar{C})(\bar{A}+B+C)$ ✓

$= (A\bar{B} + A\bar{C})(\bar{A}+B+C)$

$= 0 + 0 + A\bar{B}C + 0 + AB\bar{C} + 0.$

$= A\bar{B}C + AB\bar{C}$ ✓

$= A(\bar{B}C + B\bar{C})$ ✓

$= A(\bar{B} \oplus C)$ ✓ (4)

3.2.2 $AB + \overline{\bar{A}B\bar{C} + A\bar{B} + \bar{A}C}$

$AB + (\overline{\bar{A}B\bar{C}}) \cdot \overline{A\bar{B}} \cdot \overline{\bar{A}C}$ ✓ ✓

$AB + (\bar{\bar{A}} + \bar{B} + \bar{\bar{C}})(\bar{A}+\bar{\bar{B}})(\bar{\bar{A}}+\bar{C})$ ✓

$AB + (A + \bar{B} + C)(\bar{A}+B)(A+\bar{C})$ ✓

$AB + (0 + AB + \bar{A}\bar{B} + 0 + \bar{A}C + BC)(A+\bar{C})$ ✓

$AB + AB + 0 + 0 + ABC + AB\bar{C} + \bar{A}\bar{B}\bar{C} + 0 + 0$

$= AB + \bar{A}\bar{B}\bar{C}$ ✓ (6)

QUESTION 4: [25]

A	B	C	D	f_1	f_2	f_3	f_4
0	0	0	0	0	0	0	0
0	0	0	1	0	0	0	1
0	0	1	1	0	0	1	0
0	0	1	0	0	0	1	1
0	1	1	0	0	1	0	0
0	1	1	1	1	0	1	1
0	1	0	1	1	1	0	0
0	1	0	0	1	1	0	1
1	1	0	0	1	1	1	0
1	1	0	1	1	1	1	1
1	1	1	1	x	x	x	x
1	1	1	0	x	x	x	x
1	0	1	0	x	x	x	x
1	0	1	1	x	x	x	x
1	0	0	0	x	x	x	x
1	0	0	1	x	x	x	x

f_1

	$\bar{A}\bar{B}$	$\bar{A}B$	AB	$A\bar{B}$
$\bar{C}\bar{D}$	0	1	1	x
$\bar{C}D$	0	1	1	x
CD	0	1	x	x
$C\bar{D}$	0	0	x	x

$f_1 = B\bar{C} + BD$

$= \overline{B\bar{C} + BD}$

$= \overline{B\bar{C}} \cdot \overline{BD}$ ✓

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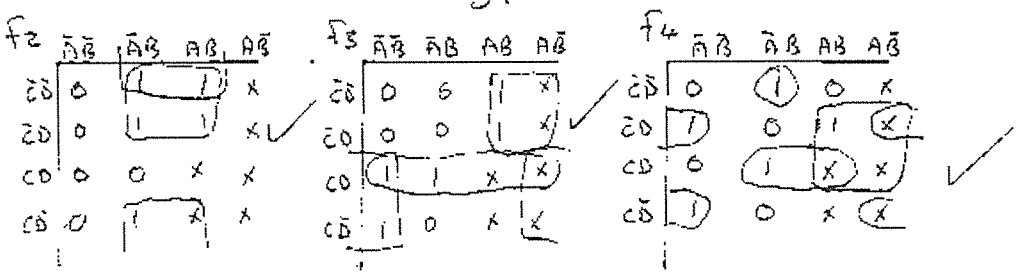
5.



$f_2 = B\bar{C} + B\bar{D}$

$= \overline{B\bar{C} + B\bar{D}}$

$= \overline{\overline{B\bar{C}} \cdot \overline{B\bar{D}}}$ ✓

$f_3 = A\bar{C} + \bar{B}C + CD$

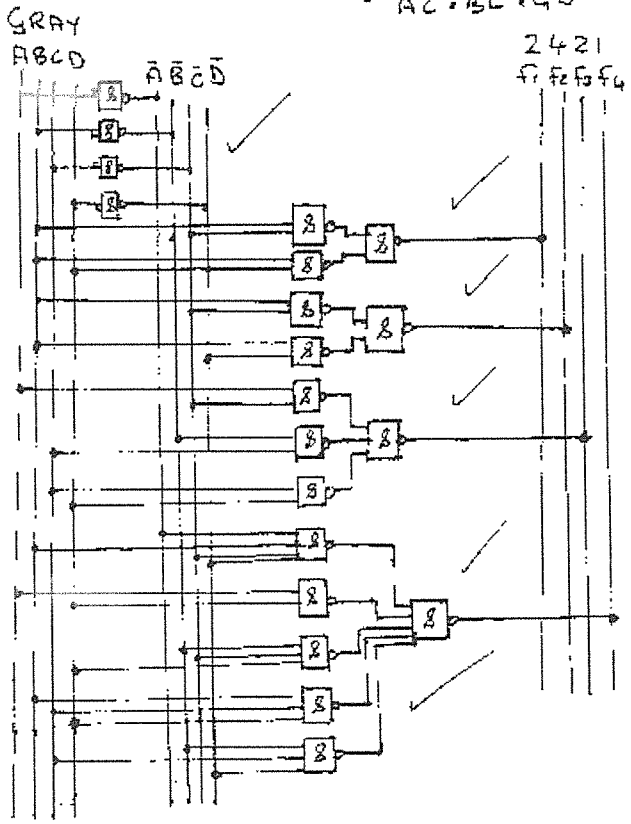
$= \overline{\overline{A\bar{C} + \bar{B}C + CD}}$ ✓

$= \overline{\overline{A\bar{C}} \cdot \overline{\bar{B}C} \cdot \overline{CD}}$

$f_4 = \bar{A}B\bar{C}\bar{D} + AD + \bar{B}\bar{C}D + BCD + \bar{B}\bar{C}\bar{D}$

$f_4 = \overline{\overline{\bar{A}B\bar{C}\bar{D} + AD + \bar{B}\bar{C}D + BCD + \bar{B}\bar{C}\bar{D}}}$ ✓

$= \overline{\overline{\bar{A}B\bar{C}\bar{D}} \cdot \overline{AD} \cdot \overline{\bar{B}\bar{C}D} \cdot \overline{BCD} \cdot \overline{\bar{B}\bar{C}\bar{D}}}$



(16)

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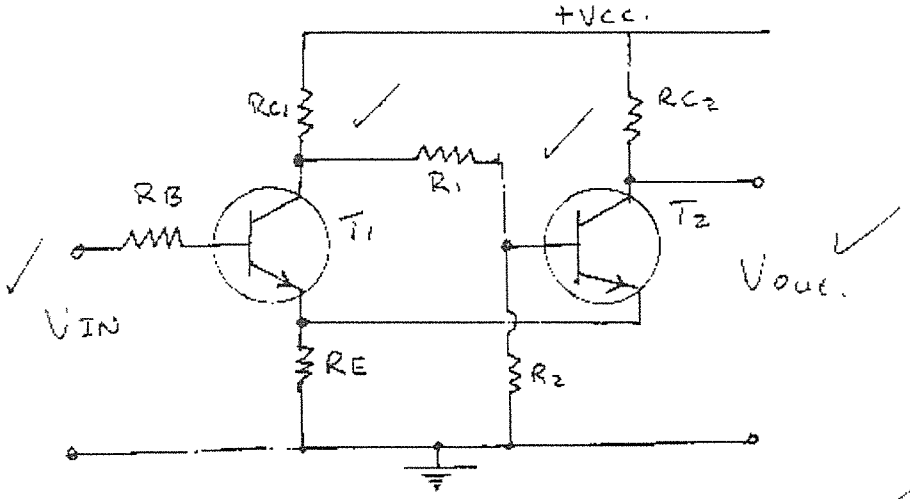
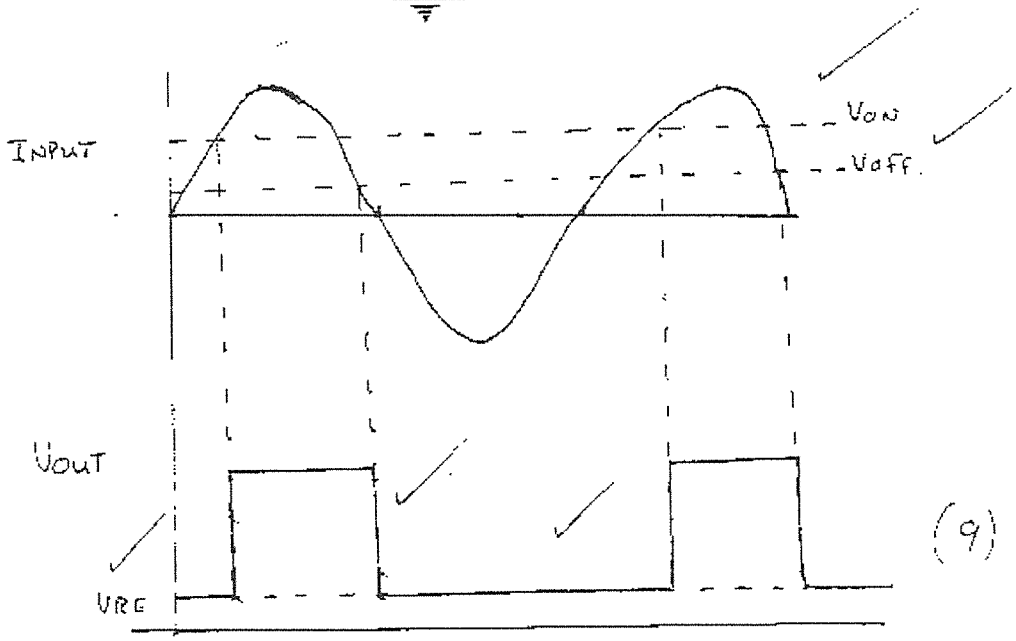
6.

QUESTION 5.





(9)

TOTAL = 100

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