higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

DIGITAL ELECTRONICS N5

1 December 2023

This marking guideline consists of 7 pages.

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QUESTION 1

1.1 D
1.2 A
1.3 B
1.4 D
1.5 B
1.6 A

(6 × 1) **[6]**

QUESTION 2

2.1 D
2.2 E
2.3 A
2.4 B
2.5 C

(5 × 1) **[5]**

QUESTION 3

3.1 A = $6F,3_{16}$ = $01101111,0011_2$✓
B = $34,2_8$ = $011100,010_2$✓
C = $16,75_{10}$ = $10000,11_2$✓ (3)

3.2

						1	1	0	1	1	1	1	0	0	1	1	
									1	0	0	0	0	1	1		
						1	1	0	1	1	1	1	0	0	1	1	
					1	1	0	1	1	1	1	0	0	1	1		✓✓
1	1	0	1	1	1	1	0	0	1	1	0	0	0	0			
1	1	1	0	1	0	0	0	1	1	0,	0	1	1	0	0	1	✓

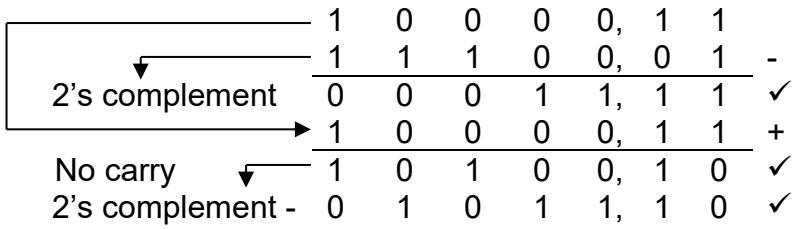
Answer: 1 1 1 0 1 0 0 0 1 1 0, 0 1 1 0 0 1_2 = 7 4 6, 6 4_{16}✓ (4)

3.3

													1,	1	0	1	✓
1	0	0	0	0	1	1	1	1	1	0	0	0	1,	0	0	0	
							1	0	0	0	0	1	1	-			
								1	0	1	1	1	0	0			
							1	0	0	0	0	1	1	-			✓
									1	1	0	0	1	0	0		
								1	0	0	0	0	1	1	-		✓
										1	0	0	0	0	1		

Answer: 1, 1 0 1_2 = 1, 6 2 5✓ (4)

3.4



Answer: - 1 0 1 1, 1_2 = -1 3, 4_8✓ (4)

[15]

QUESTION 4

BCD					Ex3-BCD			
A	B	C	D		F_A	F_B	F_C	F_D
0	0	0	0		0	0	1	1
0	0	0	1		0	1	0	0
0	0	1	0		0	1	0	1
0	0	1	1		0	1	1	0
0	1	0	0		0	1	1	1
0	1	0	1		1	0	0	0
0	1	1	0		1	0	0	1
0	1	1	1		1	0	1	0
1	0	0	0		1	0	1	1
1	0	0	1		1	1	0	0

	$\overline{A}\,\overline{B}$	$\overline{A}\,B$	$A\,B$	$A\,\overline{B}$
$\overline{C}\,\overline{D}$			d	1
$\overline{C}\,D$		1	d	1
$C\,D$		1	d	d
$C\,\overline{D}$		1	d	d

$F_A = A + B\,D + B\,C$ ✓ ✓ ✓

OR

	$\overline{C}\,\overline{D}$	$\overline{C}\,D$	$C\,D$	$C\,\overline{D}$
$\overline{A}\,\overline{B}$				
$\overline{A}\,B$		1	1	1
$A\,B$	d	d	d	d
$A\,\overline{B}$	1	1	d	d

	$\overline{A}\,\overline{B}$	$\overline{A}\,B$	$A\,B$	$A\,\overline{B}$
$\overline{C}\,\overline{D}$		1	d	
$\overline{C}\,D$	1		d	1
$C\,D$	1		d	d
$C\,\overline{D}$	1		d	d

$F_B = B\,\overline{C}\,\overline{D} + \overline{B}\,D + \overline{B}\,C$ ✓ ✓ ✓

OR

	$\overline{C}\,\overline{D}$	$\overline{C}\,D$	$C\,D$	$C\,\overline{D}$
$\overline{A}\,\overline{B}$		1	1	1
$\overline{A}\,B$	1			
$A\,B$	d	d	d	d
$A\,\overline{B}$		1	d	d

	$\overline{A}\,\overline{B}$	$\overline{A}\,B$	$A\,B$	$A\,\overline{B}$
$\overline{C}\,\overline{D}$	1	1	d	1
$\overline{C}\,D$			d	
$C\,D$	1	1	d	d
$C\,\overline{D}$			d	d

OR

	$\overline{C}\,\overline{D}$	$\overline{C}\,D$	$C\,D$	$C\,\overline{D}$
$\overline{A}\,\overline{B}$	1		1	
$\overline{A}\,B$	1		1	
$A\,B$	d	d	d	d
$A\,\overline{B}$	1		d	d

$F_C = C\,D + \overline{C}\,\overline{D}$ ✓

$F_C = \overline{C \oplus D}$ ✓✓

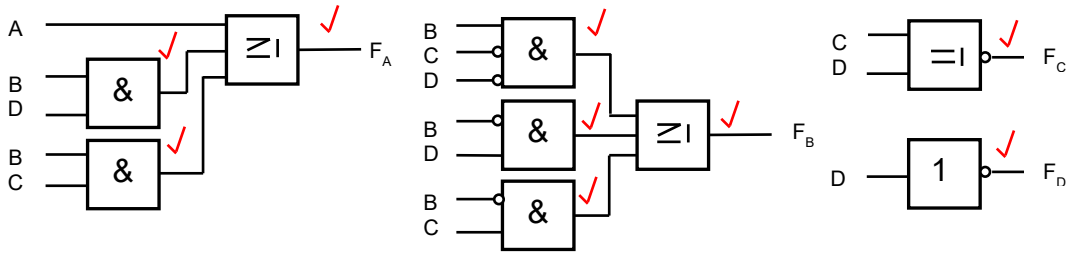
If the candidate recognises this as an XNOR gate then both marks are to be awarded.

	$\overline{A}\,\overline{B}$	$\overline{A}\,B$	$A\,B$	$A\,\overline{B}$
$\overline{C}\,\overline{D}$	1	1	d	1
$\overline{C}\,D$			d	
$C\,D$			d	d
$C\,\overline{D}$	1	1	d	d

OR

	$\overline{C}\,\overline{D}$	$\overline{C}\,D$	$C\,D$	$C\,\overline{D}$
$\overline{A}\,\overline{B}$	1			1
$\overline{A}\,B$	1			1
$A\,B$	d	d	d	d
$A\,\overline{B}$	1		d	d

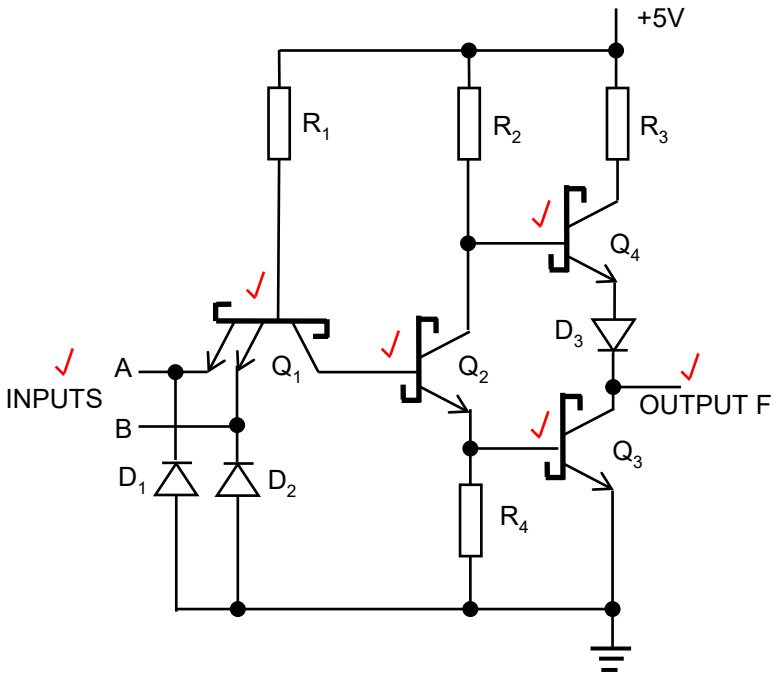
$F_D = \overline{D}$ ✓



[24]

QUESTION 5

5.1



(6)

5.2

A	B	Q_1	Q_2	Q_3	Q_4	F	
0	0	ON	OFF	OFF	ON	1	✓
0	1	ON	OFF	OFF	ON	1	✓
1	0	ON	OFF	OFF	ON	1	✓
1	1	OFF	ON	ON	OFF	0	✓

(4)
[10]

QUESTION 6

6.1 American Standard Code for Information Interchange. (1)

6.2 E✓
X✓
A✓
M✓ (4)
[5]

QUESTION 7

7.1 An electronic device that has the ability to accept data, internally store and automatically execute a program of instructions, perform mathematical and manipulative operations on data, and report the results. (3)

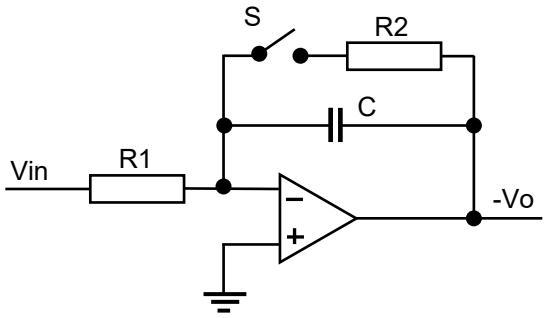
7.2
- The main processor **OR** the central processing unit
- Memory storage **OR** RAM/ROM
- Various terminals **OR** ports

Each terminal will also have
- Input units
- Output units (5)
[8]

QUESTION 8

8.1
- To convert digital data streams into analogue audio signals.
- To convert digital video data into analogue video signals.
- For converting binary or digital code into an analogue signal. (Any 1 × 2) (2)

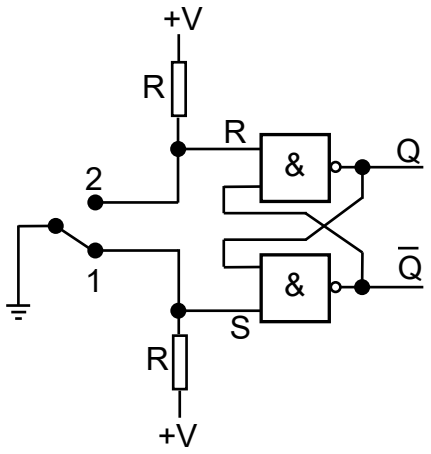
8.2



ONE mark for the correct input and output✓
ONE mark for correctly connecting and labelling S & R2✓
ONE mark for correctly connecting C✓
ONE mark for correctly connecting the op amp✓
No half marks to be awarded. (4)
[6]

QUESTION 9

9.1



ONE mark for correctly connecting the top and bottom +V✓
ONE mark for switching and correctly connecting earth✓
ONE mark for correctly connecting AND gates✓
ONE mark for correctly connecting outputs✓
No half marks to be awarded. (4)

9.2 S is low and the Q output is low. When the switch position moves to position 2, S is high, R is low and the Q output is high.✓ If the connection with position 2 has been broken due to contact bounce, S is high R is high. In this condition, the output voltage, Q, will not change.✓ (2)
[6]

QUESTION 10

10.1 10.1.1 A data bus is a bi-directional bus✓ used for transporting data from the MPU✓ to the memory, I/O devices and back to the MPU.✓ (3)

10.1.2 An address bus is a uni-directional bus,✓ used for transporting address codes from the MPU ✓ to the memory and I/O devices.✓ (3)

10.1.3 A control bus is a bi-directional bus,✓ used for transporting control codes from the MPU✓ to the memory and I/O devices and back to the MPU.✓ (3)

10.2

Impact	Non-impact
• Printing is done by hammering a set of metal pins or a character set onto the paper via an ink ribbon • Multiple copies can be created in one pass using carbon paper • Noisy while operating • Slow operation	• It prints by depositing ink onto the paper • Multiple copies can produced by printing multiple times • Works silently • Fast operation

(Any 3 × 2) (6)

[15]

TOTAL: 100

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