higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

APRIL EXAMINATION

DIGITAL ELECTRONICS N5

7 APRIL 2016

This marking guideline consists of 8 pages.

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QUESTION 1

1.1 B
1.2 A
1.3 A
1.4 A
1.5 C
1.6 A
1.7 C
1.8 C
1.9 A
1.10 D

(10 × 1) **[10]**

QUESTION 2

2.1 STEP 1 1: Let number of bits in minuend = no. bits in subtrahend
ie. $01101011,1110_2 - 100010,110_2$ ✓

STEP 2 and 3: Add minuend + (complement subtrahend + 1)

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

IGNORE CARRY✓

STEP 4: ANSWER

+	1	0	0	1	0	0	1,	0	0	1

Answer 64+8+1+ 0,125 = $73,125_{16}$ ✓

(6)

2.2 $6B,E_{16} = 1101011,111_2$ $4,25_{10} = 100,01_2$✓

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

✓

TO HEX: $1CA,78_{16}$✓ ⟶ (6)

2.3 $100010,110_2$ / $100,01_2$✓
10001011 / 10001 (2 spaces)

					1	0	0	0,	0	0	1	✓
10001	1	0	0	0	1	0	1	1,	0	0	0	
	1	0	0	0	1							✓
	.	.	.	.	.	0	1	1	0	0	0	
							1	0	0	0	1	✓
							0	0	1	1	1	
												✓

$1000,001_2$ $=10,1_8$✓ ⟶

(6)
[18]

QUESTION 3 Marks for question 3 only add up to 8 and not 18 as indicated below.

3.1

INPUTS (GRAY)				OUTPUTS (BINARY)			
P	Q	R	S	W	X	Y	Z
0	0	0	0	0	0	0	0
0	0	0	1	0	0	0	1
0	0	1	0	0	0	1	1
0	0	1	1	0	0	1	0
0	1	0	0	0	1	1	1
0	1	0	1	0	1	1	0
0	1	1	0	0	1	0	0
0	1	1	1	0	1	0	1
1	0	0	0	1	1	1	1
1	0	0	1	1	1	1	0
1	0	1	0	1	1	0	0
1	0	1	1	1	1	0	1
1	1	0	0	1	0	0	0
1	1	0	1	1	0	0	1
1	1	1	0	1	0	1	1
1	1	1	1	1	0	1	0

√ √

(4)

3.2

RS✓
PQ

	00	01	11	10
00				
01				
11	1	1	1	1
10	1	1	1	1

✓

W = P✓

RS✓
PQ

	00	01	11	10
00				
01	1	1	1	1
11				
10	1	1	1	1

✓

X = P' Q + P Q' = P ⊕ Q✓

RS
PQ

	00	01	11	10
00			1	1
01	1	1		
11			1	1
10	1	1		

✓

Y = P ⊕ Q ⊕ R

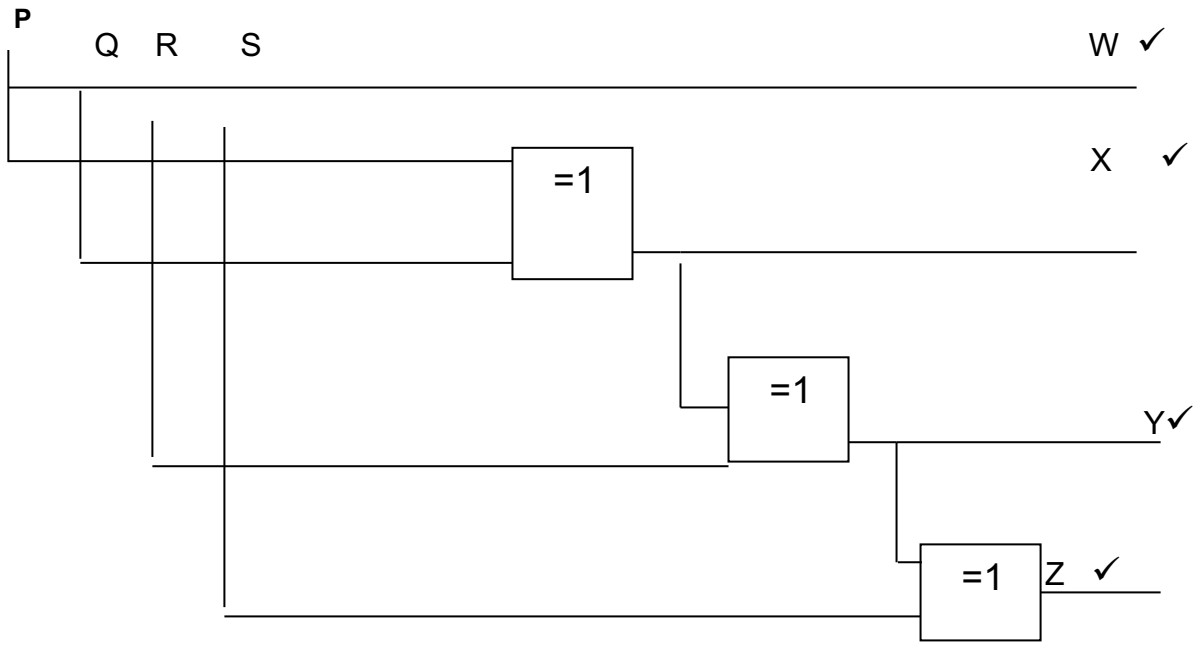
RS
PQ

	00	*01*	*11*	*10*
00		1		1
01	1		1	
11		1		1
10	1		1	

✓

Z = P ⊕ Q ⊕ R ⊕ S

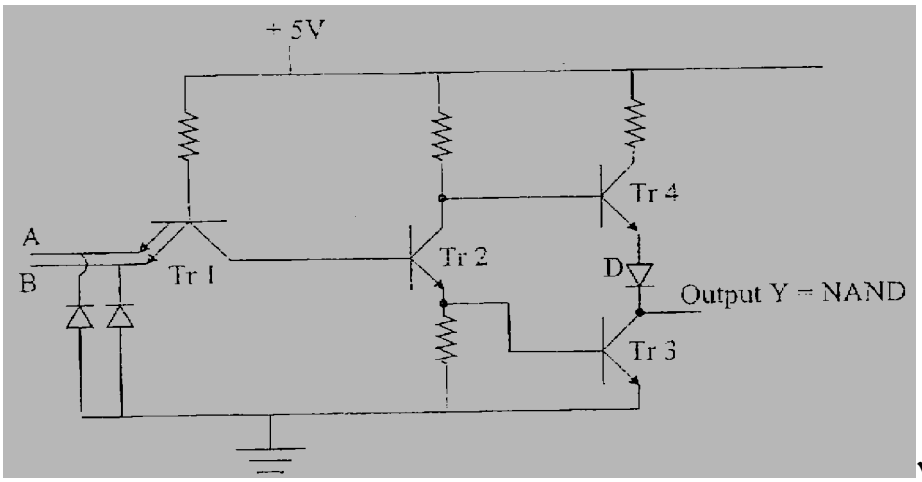
3.3



(4)
[18]

QUESTION 4

4.1

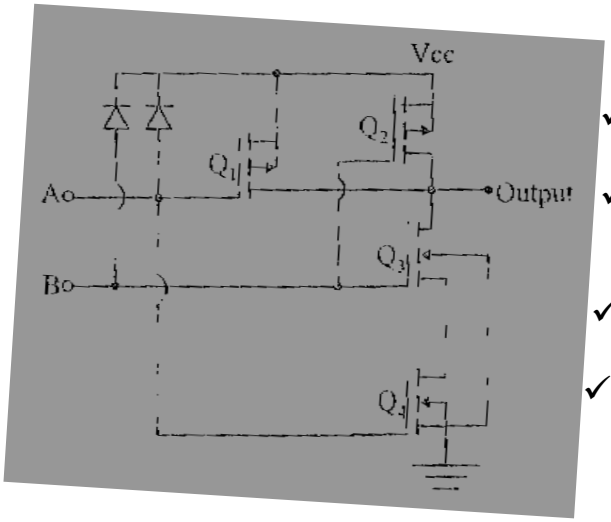


✓✓✓

✓✓✓

Output : totem pole structure: used to lower output impedance/reduce excessive loading/enhance switching speed. (Any ONE) (6)

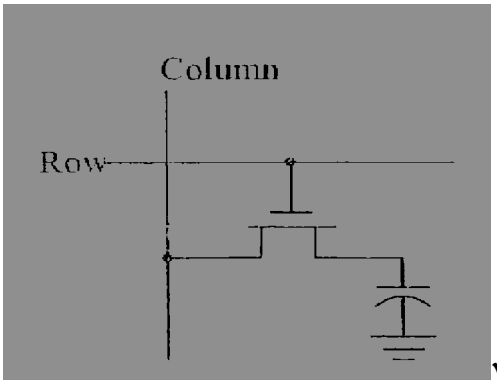
4.2



✓ ✓ ✓ √ ✓ ✓

(6)

4.3



✓✓✓✓

(4)

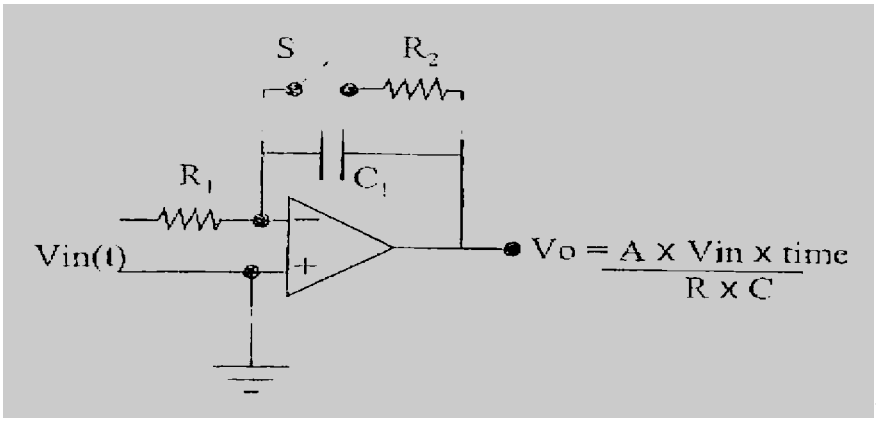
4.4 The static RAM stores data in a flip-flop-like element while a dynamic RAM stores a logic state as an electric charge in a MOS device.✓✓**OR**
The static RAM stores the data (1 or 0) as long as the integrated circuit has power, while the stored charge in the dynamic RAM must be refreshed many times per second owing to the leaking charges.✓✓

Any ONE above = 2 marks (max) (2)

[18]

QUESTION 5

5.1 5.1.1



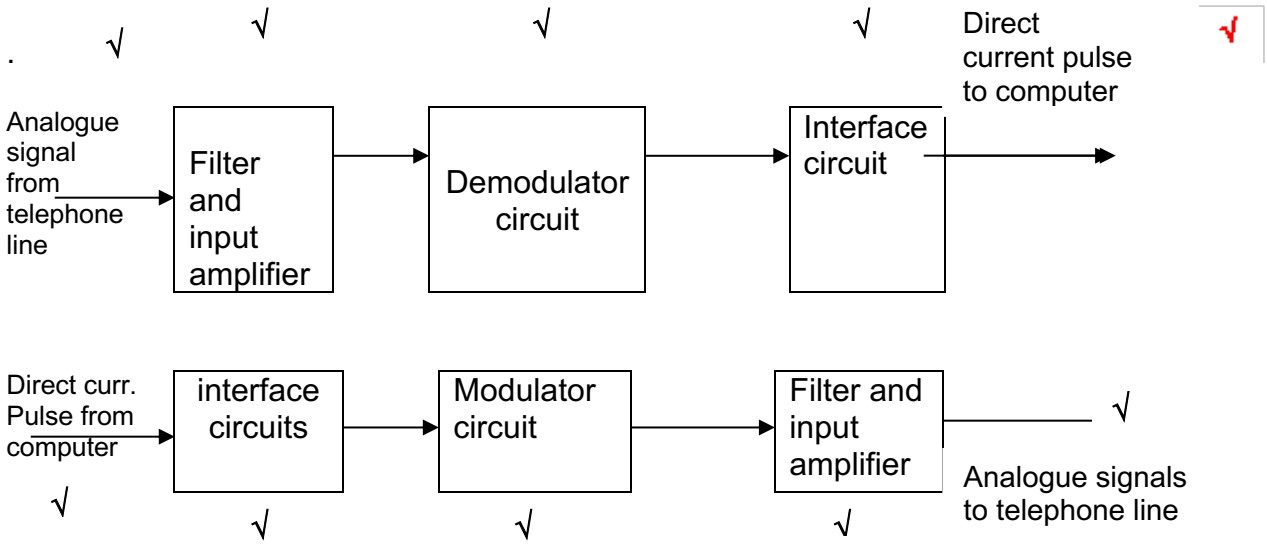
✓✓✓ (3)

5.1.2 Vo = (A x Vin x time)/ (RC) = $\frac{2448 \times 1{,}5 \times 2 \times 10^{-3}}{300\,000 \times 220 \times 10^{-6}}$

= $\frac{7{,}344}{66}$ = 0.1113V or 111,27 mV (3)

5.2 To demodulate digital data to audio signals during transmission and demodulate audio signals to digital data during reception (2)

5.3



(10)
[18]

QUESTION 6

6.1 Thermal printers use the principle of electricity being converted to heat, to create an imprint on heat-sensitive paper, while ink-jet printers use the principle of electrostatic deflection of ink, to create a character on paper.✓✓✓✓✓✓ (6)

6.2 RAM, ROM, Input/Output✓✓✓ (Any order) (3)

6.3 X – data bus: bi-directional – carries information between CPU, memories and other units.

Y – control bus: bi-directional – carries instruction codes between the CPU and other units.

Z – address bus: uni-directional – carries address codes which are used to carry data
between the CPU and other units

(9)
[18]

TOTAL: 100

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