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Question #01

a) ~~1000~~

Binary	Decimal	Gray Code
0000	0	0000 (0)
0001	1	0001 (1)
0010	2	0011 (3)
0011	3	0010 (2)
0100	4	0110 (6)
0101	5	0111 (7)
0110	6	0101 (5)
0111	7	0100 (4)
1000	8	1100 (C)
1001	9	1101 (D)
1010 (A)	10	1111 (F)
1011 (B)	11	1110 (E)
1100 (C)	12	1010 (A)
1101 (D)	13	1011 (B)
1110 (E)	14	1001 (9)
1111 (F)	15	1000 (8)

b)	1000	0101	0011	1001
a)	8	5	3	9
b)	F	7	2	E

Question #02

(i) 11100010

MSB LSB

MSB = 1 ⟶ (-ve)

11100010

1st compliment 00011101

+1

2s compliment 00011110

$\boxed{-30}$

(ii) 5C7B.6

$= (5 \times 16^3) + (12 \times 16^2) + (7 \times 16^1) + (11 \times 16^0) + (6 \times 16^{-1})$

$= (5 \times 4096) + (12 \times 256) + (7 \times 16) + (11 \times 1) + (6/16)$

$= 20480 + 3072 + 112 + 11 + 0.375$

$= \boxed{(23675.375)_{10}}$

5 C 7 B

$(0101 \cdot 1100\ 0111\ 1011.0110)_2$

(iii) $(367)_{10}$

8	367		
8	45	—	7
8	5	—	5
	0	—	5

$(0557)_8$

Question #03

A	B	C	D	f
0	0	0	0	0
0	0	0	1	1
0	0	1	0	0
0	0	1	1	1
0	1	0	0	1
0	1	0	1	1
0	1	1	0	1
0	1	1	1	1
1	0	0	0	0
1	0	0	1	1
1	0	1	0	0
1	0	1	1	0
1	1	0	0	0
1	1	0	1	0
1	1	1	0	0
1	1	1	1	1

AB \ CD	00	01	11	10
00		1	1	
01	1	1	1	1
11			1	
10		1		

$\bar{A}D$

$\bar{A}B$

BCD

$\bar{B}\bar{C}D$

SOP $\Rightarrow$ $\bar{A}D + \bar{A}B + BCD + \bar{B}\bar{C}D$

Question #04

AB \ CD	00	01	11	10
00	0	0		
01			0	0
11			0	0
10				

$A + B + C$

$\bar{B} + \bar{C}$

POS $\Rightarrow$ $(A+B+C)(\bar{B}+\bar{C})$

Question #04

AB \ CD	00	01	11	10
00			0	X
01	0	0		
11	0	0		
10	0	0	0	0

$(B + \bar{C})$

$(\bar{B} + C)$

$(A + \bar{B})$

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

~~Use De-Morgan De-Morgans law~~

$\cancel{(A+B)(B+C)(B+C)}$

Apply De-Morgans law

$$\overline{\overline{(A+\bar{B})}\;\overline{(B+\bar{C})}\;\overline{(\bar{B}+C)}}$$

If we implement $\bar{B}$ ~~we~~ by nor gate only, we will

B_not = $\bar{B}$ = B NOR B = $\overline{B+B}$

C-not = $\bar{C}$ = C NOR C = $\overline{C+C}$

$$\overline{(A + B\_not)}\ \overline{(B + C\_not)}\ \overline{(B\_not + C)}$$

$$T_1 = \overline{A + B\_not}$$

$$T_2 = \overline{T_1 + T_1} \quad \text{———} \quad (1)$$

$$T_3 = \overline{(B + C\_not)}$$

$$T_4 = \overline{T_3 + T_3} \quad \text{———} \quad (2)$$

$$T_5 = \overline{B\_not + C}$$

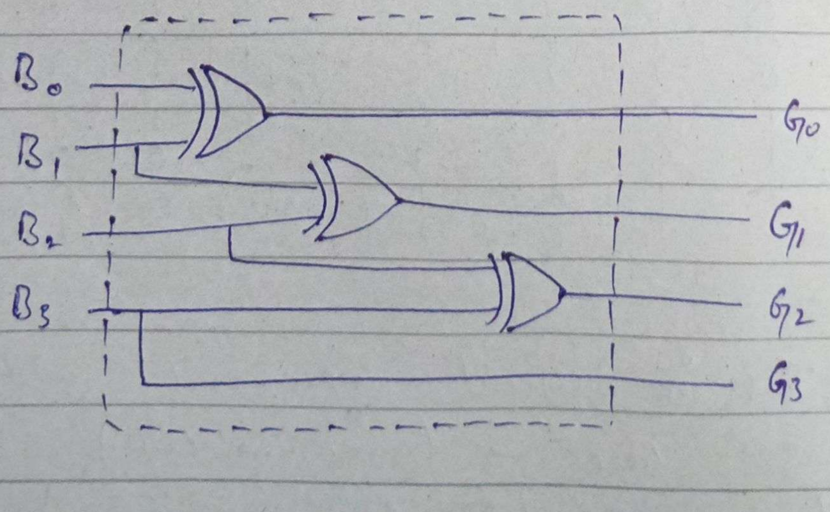
$$T_6 = \overline{T_5 + T_5} \quad \text{———} \quad (3)$$

$$final = \overline{T_2 + T_4 + T_6}$$

Question #05

B_3	B_2	B_1	B_0	G_3	G_2	G_1	G_0
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	0
0	1	0	1	0	1	1	1
0	1	1	0	0	1	0	1
0	1	1	1	0	1	0	0
1	0	0	0	1	1	0	0
1	0	0	1	1	1	0	1
1	0	1	0	1	1	1	1
1	0	1	1	1	1	1	0
1	1	0	0	1	0	1	0
1	1	0	1	1	0	1	1
1	1	1	0	1	0	0	1
1	1	1	1	1	0	0	0

$$B_3 = G_3$$
$$G_2 = B_2 \wedge B_3$$
$$G_1 = B_1 \wedge B_2$$
$$G_0 = B_0 \wedge B_1$$



Question hex6

$$E_3 = \{(B_0 + B_1)\, B_2\} + B_3$$

$$E_2 = (B_0 + B_1) \wedge B_2$$

$$E_1 = \sim(B_0 \wedge B_1)$$

$$E_0 = \sim B_0$$

	B_3	B_2	B_1	B_0	(B_0+B_1)	$(B_0+B_1)B_2$	E_3	E_2	E_1	E_0
•	0	0	0	0	0	0	0	0	1	1
1	0	0	0	1	1	0	0	1	0	0
2	0	0	1	0	1	0	0	1	0	1
3	0	0	1	1	1	0	0	1	1	0
4	0	1	0	0	0	0	0	1	1	1
5	0	1	0	1	1	1	1	0	0	0
6	0	1	1	0	1	1	1	0	0	1
7	0	1	1	1	1	1	1	0	1	0
8	1	0	0	0	0	0	1	0	1	1
9	1	0	0	1	1	0	1	1	0	0
10	1	0	1	0	1	0	1	1	0	1
11	1	0	1	1	1	0	1	1	1	0
12	1	1	0	0	0	0	1	1	1	1
13	1	1	0	1	1	1	1	0	0	0
14	1	1	1	0	1	1	1	0	0	1
15	1	1	1	1	1	1	1	0	1	0

This is circuit increment with 3 like → ($\overset{0}{0000}$ → $\overset{3}{0011}$), ($\underset{1}{0001}$ → $\underset{4}{0100}$), ($\underset{2}{0010}$ → $\underset{5}{0101}$)

B_3

AB \ CD	00	01	11	10
00	X	X	X	X
01	0			
11	1	X	X	X
10			1	

$\rightarrow AB$

$\downarrow ACD$

B_1

AB \ CD	00	01	11	10
00	X	X		X
01		1		1
11		X	X	X
10		1		1

$B_1 = (\bar{C}D) + (C\bar{D})$

$B_3 = AB + ACD$

AB \ CD	00	01	11	10
00	X	X		X
01			1	
11		X	X	X
10	1	1		1

$\rightarrow \bar{B}\bar{D}$

$\rightarrow BCD$

$\downarrow \bar{B}\bar{C}$

$B_2 = \bar{B}\bar{C} + \bar{B}\bar{D} + BCD$

when the outputs Becomes ~~Out~~ Input

$B_0 = \overline{E_0}$

$B_1 = \bar{C}D + C\bar{D}$

$B_2 = \bar{B}\bar{C} + \bar{B}\bar{D} + BCD$

$B_3 = AB + ACD$