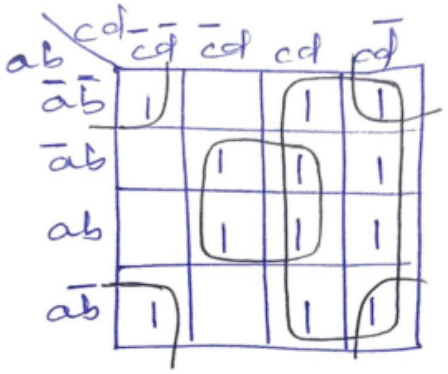
TUTORIAL 5 SOLN.

Q1)

Ans1

$$f(a,b,c,d) = ac + bc + \bar{a}bcd + \bar{a}\bar{b}c + bd + \bar{b}\bar{c}\bar{d}$$



from the K-map, the set of essential prime-implicants is

$$c, ad, \bar{b}\bar{d}$$

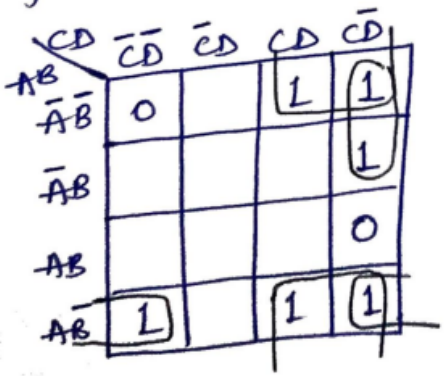
Q2)

Ans 2

f: B \ CD	$\bar{C}\bar{D}$	$\bar{C}D$	CD	$C\bar{D}$
$\bar{B}$	A	0	1	1
B	0	0	0	$\bar{A}$

B C D	f
0 0 0	A
0 0 1	0
0 1 0	1
0 1 1	1
1 0 0	0
1 0 1	0
1 1 0	$\bar{A}$
1 1 1	0

from Truth table



$$f = A\bar{B}\bar{D} + C\bar{B} + \bar{A}C\bar{D}$$

Q3)

1)

(Q) $(1101)_2 - (1010)_2$ // 13 - 10 = +3

⇒ 2's compliment of $(1010)_2$ ⇒ 0101 + 1 = 0110 i.e., $(0110)_2$

$(1101)_2 - (1010)_2$ = 1101 + 0110 = ① 0011 ⇒ $(0011)_2$

2)

Q) $(5A)_{16} - (21)_{16}$ // 90 - 33 = 57

16's compliment of $(21)_{16}$ ⇒ $(FF)_{16} - (21)_{16} + (1)_{16}$

⇒ $(DE)_{16} + (1)_{16} = (DF)_{16}$

$(5A)_{16} - (21)_{16} = (5A)_{16} + (DF)_{16}$

= ① 5A + DF

discard → ① 39 ⇒ $(39)_{16}$

i.e., $(5A)_{16} - (21)_{16} = (39)_{16}$

3)

Q) $(3E)_{16} - (7A)_{16}$ // 62 − 122 = −60

16's Compliment of $(7A)_{16} = (FF)_{16} - (7A)_{16} + (1)_{16} = (85)_{16} + (1)_{16}$

$= (86)_{16}$

$(3E)_{16} - (7A)_{16} = (3E)_{16} + (86)_{16}$

$= \begin{array}{r} \overset{1}{3E} \\ +\ 86 \\ \hline 1\ C4 \end{array}$ (discard the 1)

$\because (3E)_{16} < (7A)_{16}$ we perform 16's complement again to denote −ve No.

16's compliment of $(C4)_{16} = (FF)_{16} - (C4)_{16} + 1 = (3B)_{16} + (1)_{16}$

$= (3C)_{16}$

$\therefore (3E)_{16} - (7A)_{16} = -(3C)_{16}$

Q4)

Q.4

1) $(0101\ 1001)_{BCD}$

BCD To Excess 3

Adding +3 in BCD number.

$$\begin{array}{cc} 0101 & 1001 \\ +3 \rightarrow (0011) & (0011) +3 \\ \hline 1000 & 1100 \end{array}$$

Excess 3

BCD To Gray

$(0101\ 1001)_{BCD} \rightarrow (59)_{10}$

$\downarrow$ in binary

$(111100)_2$

$\downarrow$ to Gray

As we know $B_0 \oplus B_1 \oplus B_2 \cdots$

$G_1\ G_2\ G_3 \cdots$

hence $(111100)_2 \rightarrow (100010)_{gray}$

2) $(1001\ 0011)_{BCD}$

BCD To Excess 3

Adding +3 in BCD number

$$\begin{array}{cc} 1001 & 0011 \\ +3\ (0011) & (0011) +3 \\ \hline 1100 & 0110 \rightarrow \text{Excess 3} \end{array}$$

BCD To Gray

$(1001\,0011)_{BCD} \rightarrow (93)_{10}$

↓ Binary

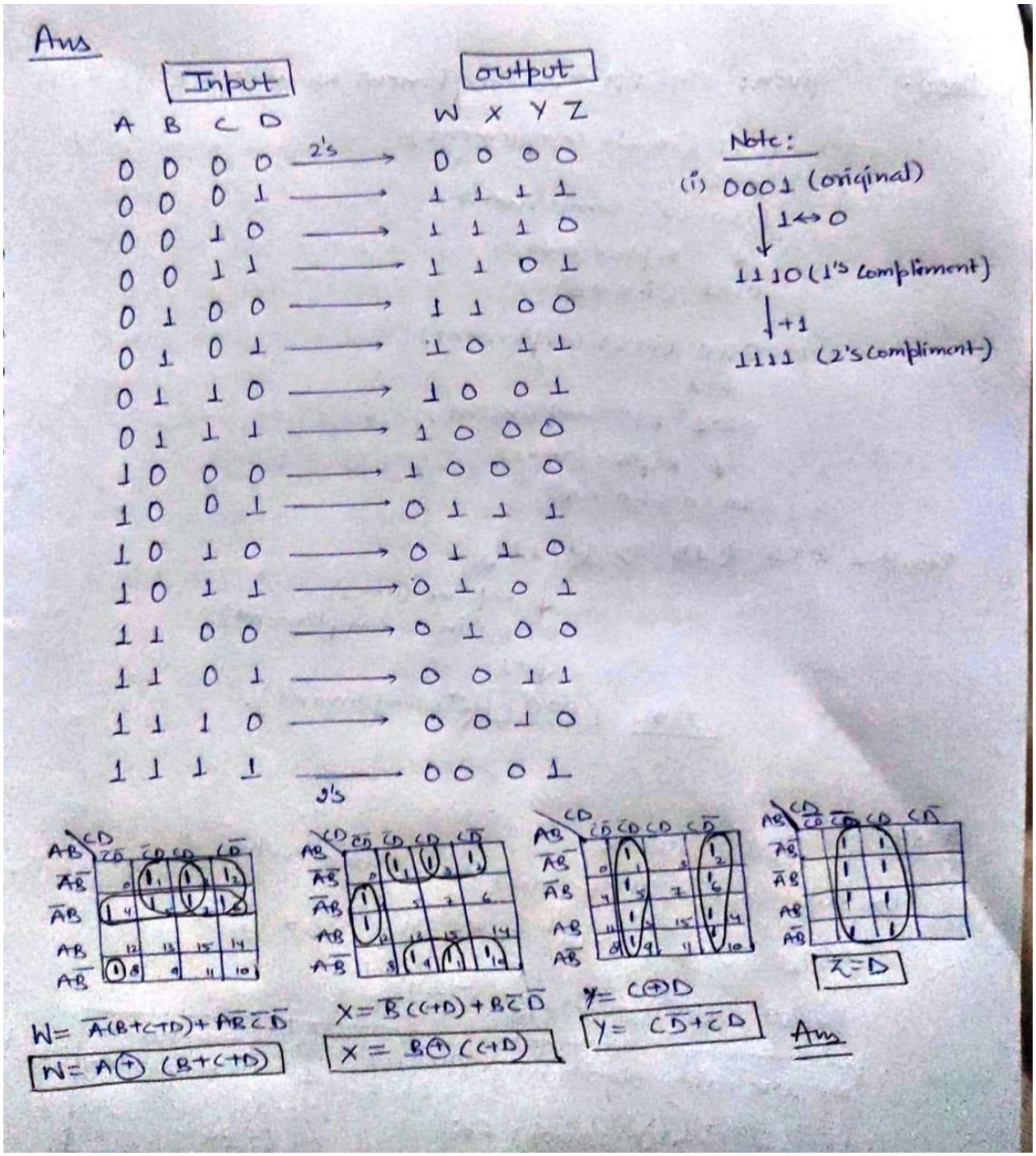
$(1011101)_2$

↓ Gray

As done in previous Conversion doing in same way we get -

$(1\,1\,1\,00\,1\,1)$ gray.

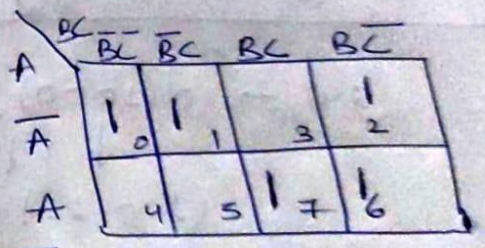
ANS 5:


Ans
Input
output
A B C D
W X Y Z
2's
1's
Note:
(i) 0001 (original)
1↔0
1110 (1's compliment)
+1
1111 (2's compliment)
W= A(B+C+D)+AB̄C̄D̄
W= A⊕(B+C+D)
X= B̄(C+D)+BC̄D̄
X= B⊕(C+D)
Y= C⊕D
Y= CD̄+C̄D
Z=D
Ans

Q6:

Ans here total number of 1's = 5

∴ implicant = 5



Implicants = $\bar{A}\bar{B}\bar{C}$, $\bar{A}\bar{B}C$, ABC, $\bar{A}B\bar{C}$, $AB\bar{C}$

Prime implicants = $\bar{A}\bar{B}$, $\bar{A}\bar{C}$, AB, $B\bar{C}$

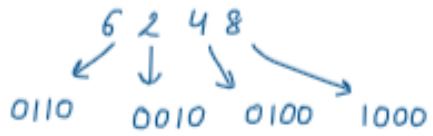
Essential prime implicants = $\bar{A}\bar{B}$, AB

Ans

Q7.

Sol^n : (a) 6248

(i) BCD code



$(6248)_{10} \longrightarrow (0110\ 0010\ 0100\ 1000)_{BCD}$

(ii) Excess -3

Excess-3 = BCD + 3

So,

0110	0010	0100	1000
+ 0011	+ 0011	+ 0011	+ 0011
1001	0101	0111	1011

$(6248)_{10} \rightarrow (1001\ 0101\ 0111\ 1011)_{excess-3}$

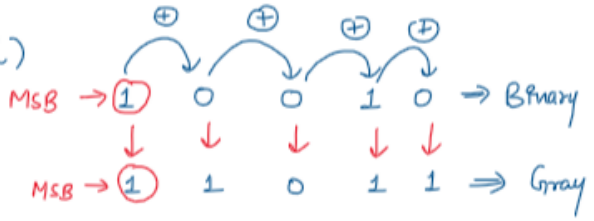
(iii) 2421 code

2	4	2	1	
0	0	0	0	0
0	0	0	1	1
0	0	1	0	2
0	0	1	1	3
0	1	0	0	4
1	0	1	1	5
1	1	0	0	6
1	1	0	1	7
1	1	1	0	8
1	1	1	1	9

$(6248)_{10} \rightarrow (1100\ 0010\ 0100\ 1110)$

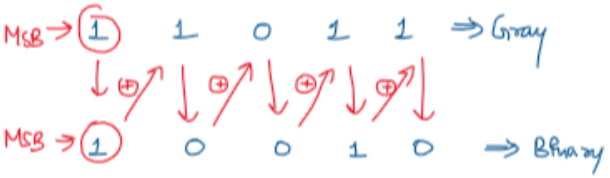
(b)

(i)



$(10010)_2 \longrightarrow (11011)_{Gray}$

(ii)



$(11011)_{Gray} \longrightarrow (10010)_2$

Q8.

Soln: Let a number N is given to the system 'S'.

output after 1's complement = 15 − N

output after 2's complement = 16 − 15 + N = N + 1

So, output of system S is (N+1).

Now, 3 such systems are connected in cascade in system 'H'.

So, Final output = Input + $(3)_{10}$

Given, Input = (1010)

$(O_3\ O_2\ O_1\ O_0)_2 = (I_3\ I_2\ I_1\ I_0)_2 + (0011)$

$= (1010)_2 + (0011)_2$

$\boxed{(O_3 O_2 O_1 O_0) = (1101)_2}$