Binary Subtraction using 1's Comp

Step 1:- Convert no to be subtracted to it's 1's Comp

Step 2:- Perform addition.

Step 3:- If the final carry is 1, then add it to the result obtained in step 2.

If the final carry is 0, result obtained in Step 2 is -ve and in its 1's Comp form.

$A - B = A + (-B)$

↑ 1's Comp

+)

$A + (-B) = S$, $FC = 1$

$+ 1$ End around Carry.

T

$A + (-B) = S$, $FC = 0$

↳ -ve and in 1's Complement form.

Ex:- Perform $(1100)_2 - (0101)_2$

$A = 1100$ $B = 0101$

Step 1:- B → 1's Comp form.

1010 → -B

Step 2:- Add

$$\begin{array}{r} 1100 \\ +1010 \\ \hline \underline{1}0110 \end{array}$$

Step3:- $FC = 1$

Add $\rightarrow$ $S + 1$

$\rightarrow 0110 + 1$

$= \underline{0111}$ Ans.

1 0 0 1 1 0

1+

0 1 1 1

End around carry.

$(1100)_2 - (0101)_2$

$12 - 5 = 7$

Dis:- End around Carry Involved this is the drawback of subtraction by 1's Comp which is not in 2's Comp Subtraction.

Ex2:- Perform $(0101)_2 - (1100)_2$

Step1:- $1100 \rightarrow$ 1's Comp

0011

Step 2:-

$$\begin{array}{rl} 0101 & (5) \\ +\ 0011 & (-12) \\ \hline 1000 & (-7) \end{array}$$

Step 3:- $FC = 0$

So ans is -ve and in its 1's Comp

$\underline{0111} \rightarrow -7$

Binary Subtraction Using 2's Comp

Step1:- Find 2's Complement of the no to be subtracte (End around Carry) of 1's Comp

Step 2:- ~~Refor~~ Perform the addition

Step 3:- If the final Carry is generated, then the result is tve and it's true form

If final Carry is not produced, then the result is negative and in its 2's Complement form.

~~Step1~~ $A - B \Rightarrow A + (-B)$
↳ 2's Comp of B.
(1's Comp+1)

Note) we neglect the final Carry always in 2's Complement Method.

Ex:- Peform subtraction

$(1001)_2 - (0100)_2$

$A = 1001$

$B = 0100$

Step1:- 2's Comp of B.

B → 0100

Short cut 2's Comp

1100

1's Comp

$$\begin{array}{r} 1011 \\ +\quad\ 1 \\ \hline 1100 \end{array}$$

Step 2:- Add

$$\begin{array}{r} 1001 \\ +\ 1100 \\ \hline 1\,0101 \end{array}$$ Ans.

Step 3:- Discarded and sum is +ve and in its true form

0101 → 5

$\frac{1001}{9} - \frac{0100}{4} = 5$

Ex:

Because of the range

-2^{n-1} to $+(2^{n-1}-1)$

the final Carry is neglected and leads to overflow.

Condition for Overflow

x & y are sign bits of two nos A & B

Z is the sign bit of result.

$\bar{x}\cdot\bar{y}z + xy\bar{z} = 0$ (no overflow)

$\bar{x}\cdot\bar{y}z + xy\bar{z} = 1$ (overflow)

Ex 2:- $(0110)_2 - (1011)_2$

A = 0110   B = 1011

Step 1:- 1011

0100
1 +
0101

Step 2:-

0110
+ 0101
01011 →

No FC, so result is -ve

1011 → 0100
1 +
0101 (+5)

Ans = -5

H.W

1) $(0110)_2 - (0100)_2$

2) $(0111)_2 - (1110)_2$

3) $(10110)_2 - (1111)_2$

use 2's Comp & 1's Comp Method.

1)

3