Bitwise
Wednesday, January 24, 2024 11:06 AM

1) BITWISE AND : &

I/p : n=5 , k=1 → n=0 0 ... 0101

O/p : Yes

2^{k-1} = 2^{1-1} = 1 = 000..0001
↳ 1st bit is set

3 : 0011
6 : 0110
0010

Bitwise Not (~)

* This will convert all the given no. from positive to -ve or vice versa
* If x = -1 → 000 ... 001
~x = 1 111 ... 110 → Value → $(2^{32}-1-1)$

x = 5 → 000..101
x = -5 → 111 ... 010 → Value $(2^{32}-1-5)$

Formula → $-x = 2^{32} - x$

* Left Shift

x = 3 x : 000 ... 0011
(x<<1) x<<1 : 000 ... 0110 →

x = -1 → $2^{32}-1$ → x : 1111 ... 111
(x<<1) : 111 ... 110 $(2^{32}-2)$

x = -1 , (x<<1) & (x<<2)

x : 1111 ...111 → 2's complement

x<<1 : 1111 ... 110 → $(2^{32}-2)$
(x<<2) : 111 ... 100 → $(2^{32}-4)$

If x = 6 & x = -6 is

x : 000 ... 110
x=-6 : 111 ... 010
↳ what we do is we will keep same till we find least number where 1 is present & will flip rest of the no.

$x * 2^y$

x = 3
x<<1 → O/P = 6
x<<2 → O/P = 12
x<<4 → O/P = 48

Single Right Shift

x = 33 : 00...100001

	O/P
x>>1 : 00....010000 →	16
x>>4 : 00 ... 000010 →	2

Unsigned Right Shift

x = -2 : 1111... 11110
x>>1 : 0111.... 11111 → $(2^{31}-1)$
x>>4 : 0000... 11111 → $(2^{28}-1)$

Binary representation of Negative Numbers

* Range of Number : $[-2^{n-1}$ to $2^{n-1}-1]$

Eg: n=4
-2^3 to 2^3-1 → -8 to 7
↳ 16-total

* Binary representation of x = -3

3 : 0011
2's complement : 1101 → flip everything after getting 1st "1"
↳ Value = -3

Direct formula → $2^n - x$