MSB is used to determine, the value is positive or negetive if -ve => 1 else 0

Lecture - 11

* Signed Magnitude Representation (SMR)

+ve integer → SMR, 1's, 2's } → Same

Q give representation of 45 in 8 bits using SMR

0 0101101
sign ←

- using 1's Compliment Representation and 2's Compliment, ans will be remain same
  00101101

Q Find 1's Compliment representation of 25 in 8 bits

0 0011001
sign bit ←

Q what will be the largest positive number that can be represented in 8 bit using SMR, 1's and 2's Compliment

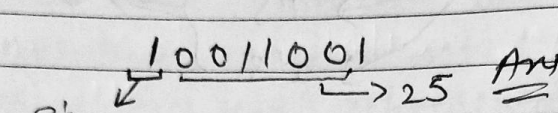
0 1111111
$2^7 - 1 = 127$ Ans

* generalized largest no using 'n' bits

SMR ⟶ $2^{n-1}-1$
1's ⟶ $2^{n-1}-1$
2's ⟶ $2^{n-1}-1$

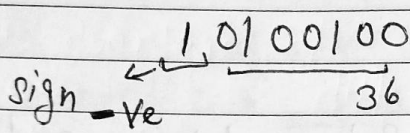
Q Represent −25 in 8 bit using 8 SMR

Ans



Ans

−36 in 8 bit using SMR



* Represent −25 in 8 bit using 1's compliment

Sl Represent +ve 25 00011001

then take 1's complement of it

11100110 ⟹ −25

−36 in 8 bit using 1's

00100100 ⟹ +36

1'S Comp → 11011011 = −36 Ans

* Same questions using 2's Compliment

S1 → Represent +25 ⇒ 00011001

Then take 2's Compliment of it ⇒ 11100111 Ans

+36 ⇒ 00100100

2's comp ⇒ 11011100

Q give representation 36 in 2's Compliment in 8 bits

⇒ 00100100

Q Find 2's Compliment representation of 36 in 8 bit

⇒ 00100100

Q Find 2's Compliment of 36 in 8 bit

11011100 Ans

Q Find 2's Compliment of -36 in 8bits

-36 ⇒ 11011100 ⇒ 00100100

in 8bit

* Range

* Range of SMR 3bit

SMR

sign

000	→ +0
001	→ +1
010	→ +2
011	→ +3
100	→ −0
101	→ −1
110	→ −2
111	→ −3

Q give representation of −0 using SMR

+0 → 00000000

sign

100 00000

* Disadvantage of SMR is, that its has 2 different representation of "0"

Range

$-2^{n-1}-1$ to $2^{n-1}-1$

singbit → $-2^{n-1}-1$ → −0

sign bit → $2^{n-1}-1$ → +0

* Range of 1's compliment representation

3bit

000 → +0	101 → −2
001 → +1	110 → −1
010 → +2	111 → −0
011 → +3	
100 → −3	

Range $-2^{3-1}-1$ to $2^{3-1}-1$

MY CHOICE
Date:
Page No.:

-36 in 1's Complement

+36 = 00100100
1's comp ⇒ 11011011 = -36

* 11011011 → 1's Compliment representation
find its decimal

1st see the sign bit → 1 ⇒ -ve
then find 1's compliment of it ⇒ 11011011
00100100 = 36
-ve -36

eg 11110000 ← 1's compliment of it
sign -ve → 00001111 ⇒ -15

00010011 → 1's complimen representation
sign +ve → ~~11101100~~ 19 → direct ans if +ve

* Range of 2's compliment representation

3 bit
sign
000 → 0
001 → 1
010 → 2
011 → 3
100 → -4
101 → -3
110 → -2
111 → -1

-2^{3-1} to $2^{3-1}-1$

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- 11001101 → in 2's Compliment rep find decimal

-ve

00110011

$1\times2+1\times2+1 = -51$ Ans

- 1 0000 000 — 2's rep

-ve ↓ → 2's Compliment

1 0000000 = — 128

generalized range → -2^{n-1} to $2^{n-1}-1$

* Best representation 2's Compliment

by default in Computer we use 2's compliment representation

- give representation of −19 using 8 bits in Computer

00010011 => +19

11101101 => −19

E D H = in hex => EDH

	SMR	1's	2's
10000000	-0	-127	-128
01111111	127	127	127
11111111	-127	-0	-1
00000000	+0	+0	0
11111110	-126	-1	-2

* Range

SMR & 1's comp — $-2^{n-1}-1$ to $2^{n-1}-1$ (sign bit)

$-2^{n-1}-1 = -0$, $2^{n-1}-1 = 0$

2's Comp — -2^{n-1} to $2^{n-1}-1$

$2^{n-1}-1 = 0$

* Gate Question

$(7)_{10}$ → SMR in 4bit

~~00~~ 0111

SMR in 8 bit enter 4bit => 00000111

$(-7)_{10}$ => SMR in 4bit = 1111 (1 → −, 111 = 7)

SMR in 8bit = 10000111 (1 → −, 111 = 7)

$(-7)_{10}$ ~~in~~ → 1's Compliment in 4bit = 0111 = +7

1000 = −7 (sign bit)

Now 1's Compliment in 8bit =

11111000 = -7 (sign bit)

sing bit will be copied in each cell.

$(-7)_{10}$ → 2's Compliment in 4bit = 0111 = +7
1001 = -7

2's Compliment in 8bit = 11111001 = -7

Q if we represent no. x in base 10 using 1's compliment representation in 8 bit reg than same no. represented in 16bit reg then extra 8 bit will contain

a) all 0's
b) all 1's
c) Sign bit will be copied ✓
d) None

if hex of a decimal number represented in 2's compliment in 8bit is 8f then same no in 16 bit will be

a) 008F
b) FF8F ✓
c) CF8F
d) FC8F