CS & IT ENGINEERING

DIGITAL LOGIC

Number System

Lecture No. 2

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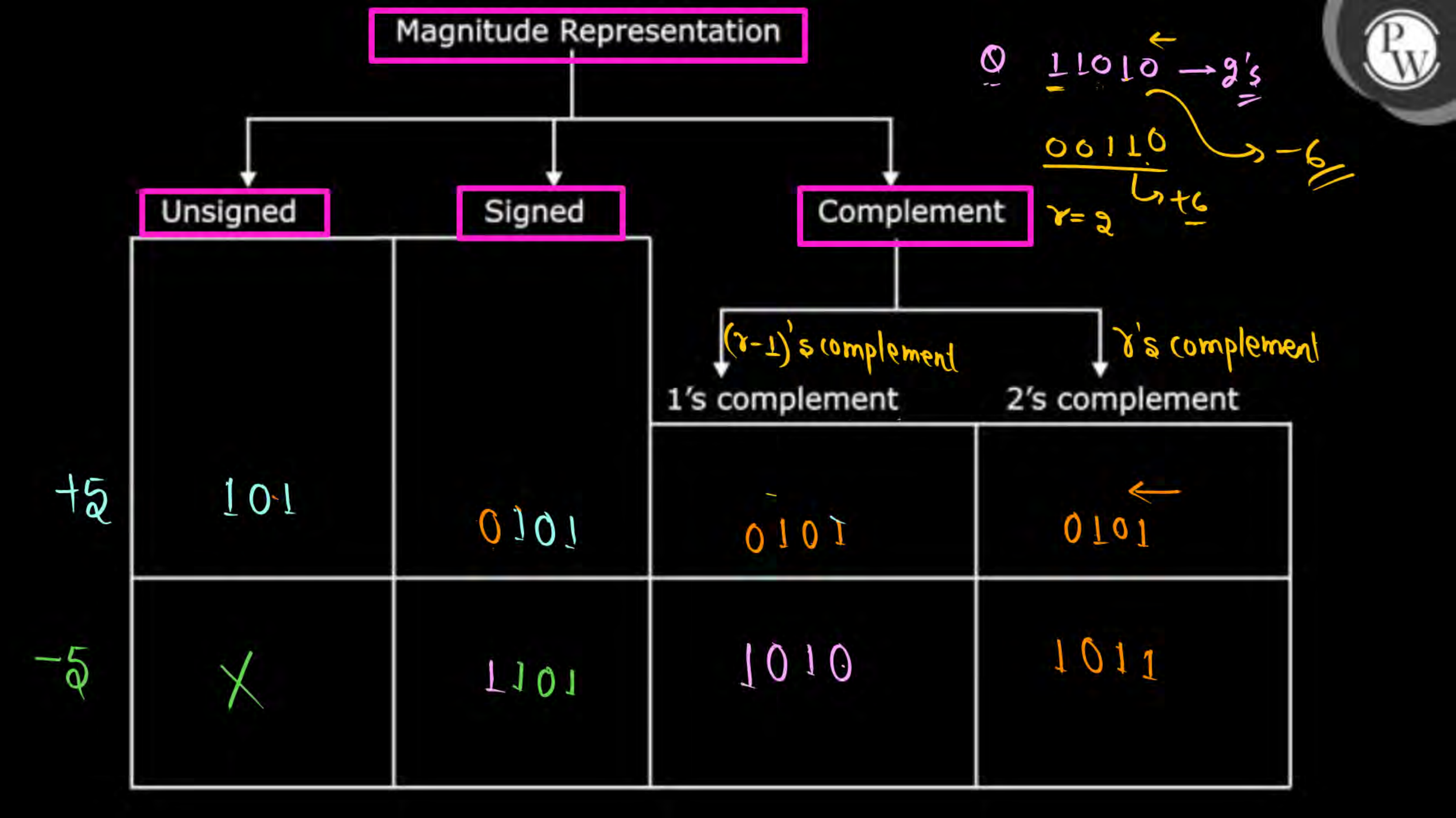
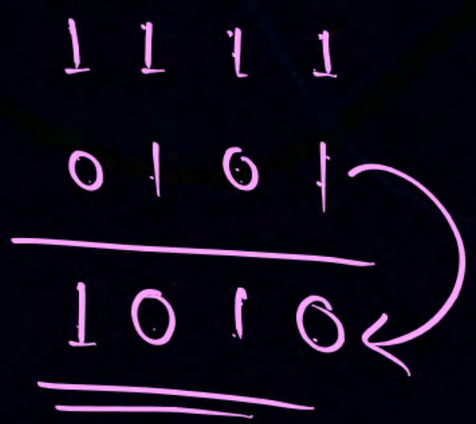
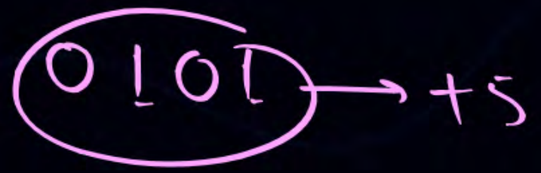
01 Magnitude Comparator

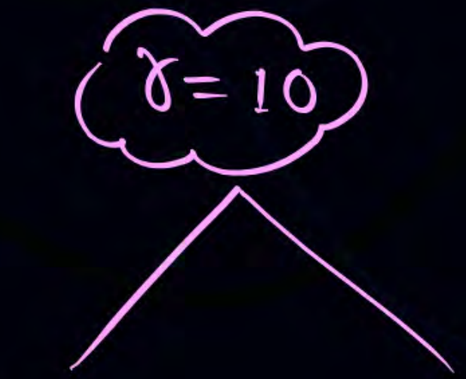
02 Practice & DISCUSSION

Decimal Digits	BCD 8421	Excess – 3	Octal digits	BCO	Hexadecimal Digits	BCH
0	0000	0011	0	000	0	0000
1	0001	0100	1	001	1	0001
2	0010	0101	2	010	2	0010
3	0011	0110	3	011	3	0011
4	0100	0111	4	100	4	0100
5	0101	1000	5	101	5	0101
6	0110	1001	6	110	6	0110
7	0111	1010	7	111	7	0111
8	1000	1011			8	1000
9	1001	1100			9	1001
					A	1010
					B	1011
					C	1100
					D	1101
					E	1110
					F	1111


Magnitude Representation
Unsigned
Signed
Complement
(r-1)'s complement
r's complement
1's complement
2's complement
+5
-5
101
0101
0101
0101
X
1101
1010
1011
Q 11010 → 2's
00110
+6
-6
r = 2


1 1 1 1
0 1 0 1
1 0 1 0


0 1 0 1
+5



9's complement 10's complement

732 find 9's complement

999
732

267

Unsigned Representation

3 Bit number

Range

0 → 7

Binary	Decimal
000	0
001	1
010	2
011	3

100	4
101	५
110	६
111	७

'n' bit unsigned

Range ⇒ 0 to $2^n - 1$

Signed Representation

$-\{2^{4-1}-1\}$ to $\{2^{4-1}-1\}$

4 Bit number

Range ⇒ −7 to +7

n bit

Range ⇒ $-\{2^{n-1}-1\}$ to $+\{2^{n-1}-1\}$

Signed Number	Equivalence Decimal
0000	+0
0001	+1
0010	+2
0011	+3
0100	+4
0101	+5
0110	+6
0111	+7

Signed Number	Equivalence Decimal
1000	−0
1001	−1
1010	−2
1011	−3
1100	−4
1101	−5
1110	−6
1111	−7

1's Complement Representations

'n' bit

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

4 Bit number

$-\{7\}$ to $+\{7\}$

1s Complement	Equivalence Decimal
0000	+0 ✓
0001	+1
0010	+2
0011	+3
0100	+4
0101	+5
0110	+6
0111	+7

1s Complement	Equivalence Decimal
1000	−7
1001	−6
1010	−5
1011	−4
1100	−3
1101	−2
1110	−1
1111	−0 ✓

0111 → 1000 → 1001 → 1010 → 1011 → 0100 → +4

0000 → 1111 → +0


0 0 1 1 0 1
+13


1 1 0 0 1 0
-13
1's
0 0 1 1 0 1
+13

2's Complement Representations

$-\{2^{4-1}\}$ to $\{2^{4-1}-1\}$

4 Bit number

-8 to $+7$

Range $^{n\text{bit}}$ $-\{2^{n-1}\}$ to $+\{2^{n-1}-$

2s Complement	Equivalence Decimal
0000	+0
0001	+1
0010	+2
0011	+3
0100	+4
0101	+5
0110	+6
0111	+7

2s Complement	Equivalence Decimal
1000	−8
1001	−7
1010	−6
1011	−5
1100	−4
1101	−3
1110	−2
1111	−1

0001

Q. If the number given below are written in 1's complement convert it into Equivalance Decimal?

① 01101 → +13

② 001101 → +13

③ 00001101 → 13

④ 110010 → −13

00 1101 → +13

⑤ 11110010 → −13

00 0011 01

+13

⑥ 11101010 → −21

00 0101 01 → 21

⑦ 0000 → +0

⑧ 1111 → −0

=

0000

Q. If the number given below are written in 2's complement convert it into Equivalance Decimal?

① 01101 → +13

② 001101 → +13

③ 00001101 → +13

④ 110010 → -14
001110

⑤ 11110010 → -14
00001110

⑥ 11101010 → -22
00010110

⑦ 0000 → 0

⑧ 1111 → -1 ✓ Ans
0001

Q. F's complement of $(2BFD)_{hex}$ is

A. E304

B. D403

C. D402

D. C403

FFFF

2BFD

D402

Q. A number is expressed in binary two's complement as 10011. Its decimal equivalent value is

01101

13

-13

A 19

B 13

C -19

D -13

Q. The greatest negative number, which can be stored in a computer that has 8-bit word length and uses 2's complement arithmetic, is

A. -256

B. -255

C. -128

D. -127

$-[2^{n-1}]$

$-[2^{8-1}] = -2^7$

$= -128$

Q. What is the resultant of $(C4)_{16} - (7B)_{16} = ?$

HW

A $(59)_{16}$

B $(39)_{16}$

C $(69)_{16}$

D $(49)_{16}$

Q. The number of bytes required to represent the decimal number 1856357 in packed BCD (Binary coded Decimal) form is _____.

HW

A 3

B 4

C 28

D 8

Q. 11001, 1001 and 111001 correspond to the 2's complement representation of which one of the following sets of number?

A. 25, 9 and 57 respectively

B. –6, –6 and –6 respectively

C. –7, –7 and –7 respectively

D. –25, –9 and –57 respectively

Q. P, Q and R are the decimal integers corresponding to the 4-bit binary number 1100 considered in signed magnitude, 1's complement and 2's complement representations, respectively. The 6-bit 2's complement representation of (P + Q + R) is

A 111101

B 110101

C 110010

D 111001

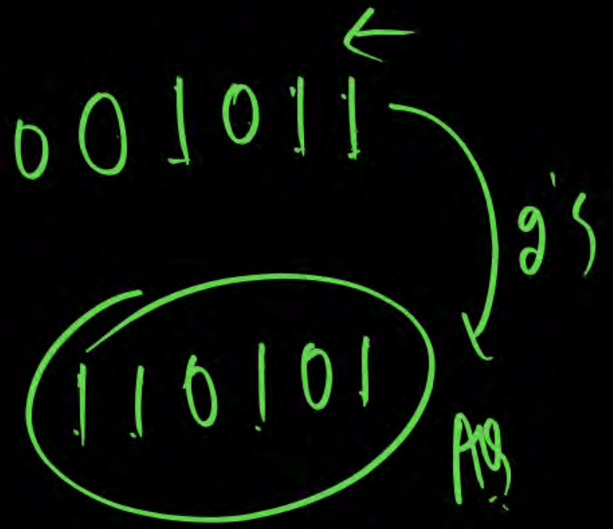
$\overline{1100}$

$P = -4$

$Q = -3$

$R = -4$

$P+Q+R = -11$



Q. What is the possible base of the given number system?

$\sqrt{41} = 5$

$\sqrt{(41)_x} = (5)_x$ $x > 5$

$\sqrt{4x+1} = 5$

$4x + 1 = 25$

$4x = 24$

$x = 6$

A. 4

B. 5

C. 10

D. 6

Q. –13 in 2's complement will be-

A 11101

B 01101

C 10010

D 110011

+13 → 01101

–13 → 10011

Q. Let us consider the following equation in a 6-bit binary number system X = A + BA is given A point as $(001010)_2$ in 1's complement binary number system, B is given as $(111010)_2$ in signed number system. What would be X in 2's complement number system?

$A = 10$

$B = -26$

$X = A + BA$

$= 10 + (-26) \times 10$

$= 10 - 260 = -250$

128	64	32	16	8	4	2	1	
0	1	1	1	1	1	0	1	0 → 250
= 1	0	0	0	0	0	1	1	0 → -250

Q. –24 in 2's complement form is

A 11101000

B 01001000

C 01111111

D 00111111

00 0 1 1 000 → +24

1 1 1 0 1 000 → -24

THANK YOU