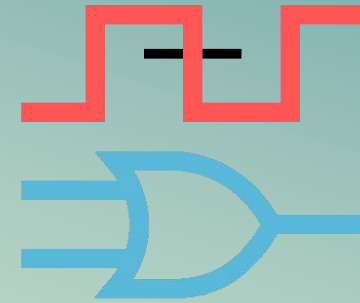


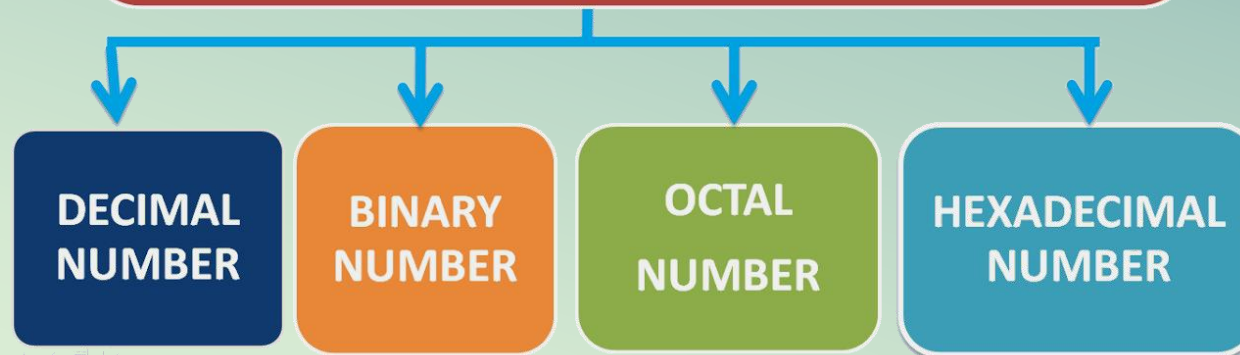
Digital Electronics

Class X
lab 17



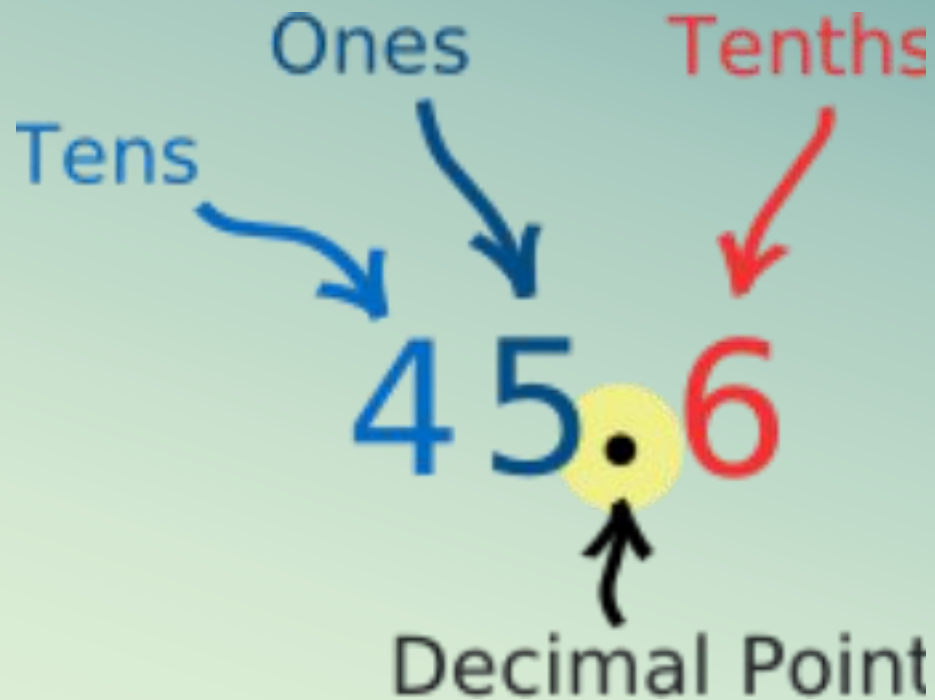
Number Systems

BASIC CONCEPTS NUMBER SYSTEMS



If base or radix of a number system is 'r', then the numbers present in that number system are ranging from zero to $r-1$.

Decimal Number System



The **base** or radix of Decimal number system is **10**. So, the numbers ranging from 0 to 9 are used in this number system

Binary Number System

Binary Base = 2

The **base** or radix of this number system is **2**. So, the numbers 0 and 1 are used in this number system

	Column 8	Column 7	Column 6	Column 5	Column 4	Column 3	Column 2	Column 1
Base^{exp}	2⁷	2⁶	2⁵	2⁴	2³	2²	2¹	2⁰
Weight	128	64	32	16	8	4	2	1

$$2^0 = 1$$

$$2^1 = 2$$

$$2^2 = 2 * 2 = 4$$

$$2^3 = 2 * 2 * 2 = 8$$

$$2^4 = 2 * 2 * 2 * 2 = 16$$

$$2^5 = 2 * 2 * 2 * 2 * 2 = 32$$

$$2^6 = 2 * 2 * 2 * 2 * 2 * 2 = 64$$

$$2^7 = 2 * 2 * 2 * 2 * 2 * 2 * 2 = 128$$

Binary to Decimal

This binary Number... **1 1 1 1 1 1 1 1** Equals this Decimal number

2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
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128 + 64 + 32 + 16 + + + 2 + 1 = 255

This binary Number... **1 0 0 1 0 1 0 1** Equals this decimal number

2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
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128 + 0 + 0 + 16 + + + 0 + 1 = 149

Octal Number System

Octal Numbers

Decimal Number	Octal Numbers
0	0
1	1
2	2
3	3
4	4
5	5
7	6
8	7
9	10
10	11
11	12
12	13

The **base** or radix of octal number system is **8**. So, the numbers ranging from 0 to 7 are used in this number system

Decimal to Octal

7	1	2	6	3
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8^4 8^3 8^2 8^1 8^0

decimal:

$$\begin{array}{rcll} 3 \times 8^0 & = & 3 \\ 6 \times 8^1 & = & 48 \\ 2 \times 8^2 & = & 128 \\ 1 \times 8^3 & = & 512 \\ 7 \times 8^4 & = & 28672 \\ \hline & & 29363 \end{array}$$

Octal to Decimal

7	1	2	6	3
---	---	---	---	---

8^4 8^3 8^2 8^1 8^0

decimal:

3 x 8^0 = 3

6 x 8^1 = 48

2 x 8^2 = 128

1 x 8^3 = 512

7 x 8^4 = 28672

29363

Hexadecimal Number System

Decimal	4-Bit Binary	Hexadecimal
0	0000	0
1	0001	1
2	0010	2
3	0011	3
4	0100	4
5	0101	5
6	0110	6
7	0111	7
8	1000	8
9	1001	9
10	1010	A
11	1011	B
12	1100	C
13	1101	D
14	1110	E
15	1111	F

The **base** or radix of Hexadecimal number system is **16**. So, the numbers ranging from 0 to 9 and the letters from A to F are used in this number system

Thank You