

Number systems:-

The system of arithmetic which are frequently used in digital circuit or As the term digital implies a system of coupling using discrete units, there are four system of arithmetic:

- (1) Decimal
- (2) Binary
- (3) Octal and
- (4) Hexadecimal.

Digital systems used binary system extensively. We shall discuss them briefly.

(1) Decimal number system:-

This is frequently used number system in our daily life. It contains 10 unique symbols: 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9. Because it has symbols its base used is to be 10. To indicate digits greater than 9 the digits are arranged by columns on the left of decimal point, each column having a different weight or multiplying factor. e.g- they are named as hundreds, tens and units. Similarly to represent digits less than 1, the position to the

②  
right of the decimal point are named  
as tenths, hundredths, thousandths etc.  
For example :- number

$$432.45_{10} = 4 \times 10^2 + 3 \times 10^1 + 2 \times 10^0 + 4 \times 10^{-1} + 5 \times 10^{-2}$$

(2) Binary number system :-

The binary number system uses only two digits 0 and 1, as contrasted to the ten digits of the decimal system. The base (radix) for this system is 2 and the position to the left or right of the binary point carry weights increasing or decreasing in powers of 2. For example :- number

$$101011_2 = 1 \times 2^5 + 0 \times 2^4 + 1 \times 2^3 + 0 \times 2^2 + 1 \times 2^1 + 1 \times 2^0$$

$$= 32 + 0 + 8 + 0 + 2 + 1$$

$$= 43_{10} \text{ in decimal system}$$

$$0.1101 = 1 \times 2^{-1} + 1 \times 2^{-2} + 0 \times 2^{-3} + 1 \times 2^{-4}$$

$$= \frac{1}{2} + \frac{1}{4} + 0 + \frac{1}{16}$$

$$= 0.500 + 0.250 + 0.062$$

$$= 0.812_{10} \text{ in decimal system}$$

So, that,

$$101011.1101_2 = 43.812_{10}$$

Not that in binary operation only two states are possible. For example in logic - a statement is characterized as true or false. A switch may be open or closed. Its equivalent in electronics is a transistor operating at cut off or at saturation but not in an active region. However, binary arithmetic and mathematical manipulation of switching or logic function are best carried out which involves two symbols, 0 (zero) and 1 (one), as explained above.

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