Digital Electronics And Logic Design

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July 2, 2025

Syllabus

Introduction to digital Systems :- Digital abstraction Number Systems – Binary, Hexadecimal, grouping bits, Base conversion; Binary Arithmetic – Addition and subtraction, Unsigned and Signed numbers; Fixed-Point Number Systems; Floating-Point Number Systems Basic gates- Operation of a Logic circuit; Buffer; Gates - Inverter, AND gate, OR gate, NOR gate, NAND gate, XOR gate, XNOR gate; Digital circuit, operation - logic levels, output dc specifications, input dc specifications, noise margins, power supplies; Driving loads - driving other gates, resistive loads and LEDs.

1 Conversion from Decimal to Other Bases

1.1 Changing Base of the Whole Number Part

$$(18)_{10} = (?)_2$$

We use repeated division by the target base (2 in this case):

$$\begin{array}{r|l} 18 & \div 2 \\ \hline 9 & \text{remainder } 0 \\ \div 2 & \\ \hline 4 & \text{remainder } 1 \\ \div 2 & \\ \hline 2 & \text{remainder } 0 \\ \div 2 & \\ \hline 1 & \text{remainder } 0 \\ \div 2 & \\ \hline 0 & \text{remainder } 1 \end{array} \tag{1}$$

Now, read the remainders from **bottom to top** to get the binary equivalent:

$$(18)_{10} = (10010)_2$$

1.2 Changing Base of the Fractional Part

How do we convert a **fractional decimal** to another base?

$$(0.25)_{10} = (?)_2$$

We use repeated multiplication of the fractional part by the base (2 in this case):

$$\begin{aligned} 0.25 \times 2 = 0.5 &\quad \Rightarrow \text{Digit: } 0 \\ 0.5 \times 2 = 1.0 &\quad \Rightarrow \text{Digit: } 1 \text{ (stop: fraction is now 0)} \end{aligned}$$

Now write the digits from top to bottom after the binary point:

$$(0.25)_{10} = (0.01)_2$$

Hexadecimal (Base 16)

Decimal	**Hexadecimal**
0	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	A
11	B
12	C
13	D
14	E
15	F

Just like how 10 comes after 9, 10 comes after FF