logic Design

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Lecture 1

* Digital system :.
→ The Physical quanties or signals show only discrete values
* Analog system :.
→ The Physical quantities or signals show The Continouse spastic Range

* Binary digital system.
→ two level or Binary value are The most prevalent values.
* Binary values like :.
  - o and 1
  - F and T
  - L and H
  - on and off.

* Decimal Number system. "Base 10"
⇒ The Power of 10 is implied by digit (coefficient) Position.

e.g. 1853

↳ $1 \times 10^3 = 1000$
$8 \times 10^2 = 800$
$5 \times 10^1 = 50$
$3 \times 10^0 = 3$

1853

* follow Decimal number system (Base 10)
→ Formal Notation $(\ldots)_{10}$

$\ldots + d_2 * B^2 + d_1 * B^1 + d_0 * B^0 + d_{-1} * B^{-1} + d_{-2} * B^{-2} + \ldots$

↳ to Solve the Problame $\boxed{B=10}$ due to it The Base of system

* Binary Number System (Base 2)
→ Formal Notation $(\ldots)_2$

→ ex. Convert From Binary to decimal
$(11010.11)_2$

$2^4 \times 1 + 2^3 \times 1 + 2^2 \times 0 + 2^1 \times 1 + 2^0 \times 0 + 2^{-1} \times 1 + 2^{-2} \times 1$
$16 + 8 + 0 + 2 + 0 + 0.5 + 0.25$
$= (26.75)_{10}$

* Base_5 Number System
→ Fromal Notation $(\ldots)_5$

ex. Convert From Base 5 to Decimal
$(402.12)_5$
$5^3 \times 4 + 5^2 \times 0 + 5^1 \times 2 + 5^0 \times 1 + 5^{-1} \times 2$
$= (511.4)_{10}$

* octal Number System (Base 8)
→ Formal Notation $(\ldots)_8$

* ex. Convert From octal System to Decimal
$(127.4)_8$
$8^2 \times 1 + 8^1 \times 2 + 8^0 \times 7 + 8^{-1} \times 4$
$= (87.5)_{10}$

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* HexaDecimal system (Base 16)
→ Fromal Notation $(\_\_\_)_{16}$

ex. Convert From HexaDecimal to Decimal
B 6 5 F
$16^3 \times B + 16^2 \times 6 + 16^1 \times 5 + 16^0 \times F$
$16^3 \times 11 + 16^2 \times 6 + 16^1 \times 5 + 16^0 \times 15$
$= (46.687)_{10}$

Note: HexaDecimal used to represent long strings
for example $(1011)_2 = (B)_{16} = (11)_{10}$

$1 \times 2^3 + 0 \times 2^2 + 2^1 \times 1 + 2^0 \times 1$
$= (11)_{10} = (B)_{16}$

* More about Binary system:
→ The digits in a Binary number are called Bits
→ Computer Capacity given in bytes, byte is equal eight Bits
→ Please See Slides Number 26 and 27 and 28 Keep (important information)

* Conversions law
to Convert From any system to any system you must Convert to decimal firstly Then Convert From decimal to any system
ex. octal → Decimal → Binary
Binary → Decimal → octal
and so on ...

→examples

- From Decimal to Binary

$(13)_{10} = (1011)_2$

13	2	1
6	2	0
3	2	1
1	2	1

- From Decimal to Binary

$(0.625)_{10} = (0.101)_2$

$0.625 \times 2 = \boxed{1}.25$

$0.25 \times 2 = \boxed{0}.5$

$0.5 \times 2 = \boxed{1}.0$

- From Decimal to octal

→ $(175)_{10} = (257)_8$

175	8	7
21	8	5
2	8	2

→ $(0.3125)_{10} = (0.24)_8$

$0.3125 \times 8 = \boxed{2}.5$

$0.5 \times 8 = \boxed{4}.0$

- From Decimal to Hexadecimal

→ $(175)_{10} = (AF)_{16}$

175	16	15 = F
10	16	10 = A

→ $(0.3125)_{10} = (0.5)_{16}$

$0.3125 \times 16 = \boxed{5}.0$

for more example See Slides From 34 to 47

Good luck.