Hi...

I am SUMAIYAH

Digital Logic Design

It's as easy
as 01, 10, 11

Sumaiyah Zahid

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Dictionary

Search for a word

digital

/ˈdɪdʒɪt(ə)l/

See definitions in:

All | Technology | Clockmaking | Anatomy

adjective

1. (of signals or data) expressed as series of the digits 0 and 1, typically represented by values of a physical quantity such as voltage or magnetic polarization.
2. (of a clock or watch) showing the time by means of displayed digits rather than hands or a pointer.

Definitions from Oxford Languages Feedback

Translations and more definitions

People also ask

What is digital explain?

Digital data

Digital data, in information theory and information systems, is information represented as a string of discrete symbols each of which can take on one of only a finite number of values from some alphabet, such as letters or digits. An example is a text document, which consists of a string of alphanumeric characters. Wikipedia

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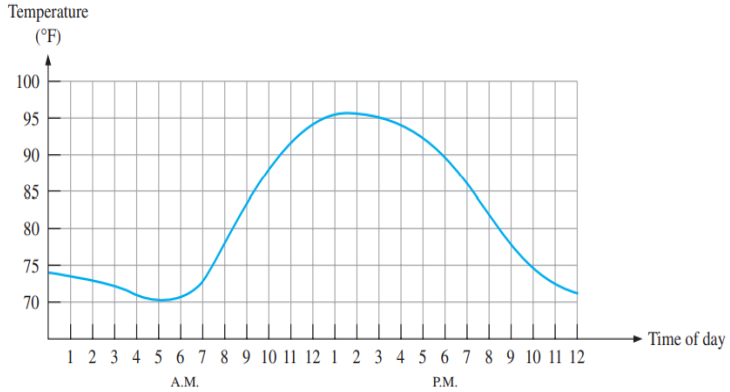
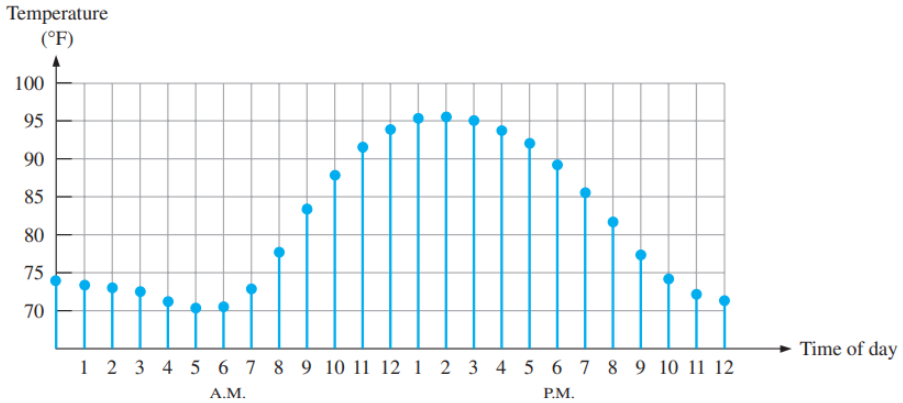
Analog Vs Digital

An analog quantity has continuous values.

A digital quantity has discrete set of values.





Digital Advantage

It can be processed and transmitted more efficiently.

It can be stored more compactly and reproduced with greater accuracy.

Less prone to noise.

Each Smart Watch is a Digital Watch.

Each Smart Phone is a Digital Phone.

Each Smart City is a Digital City.

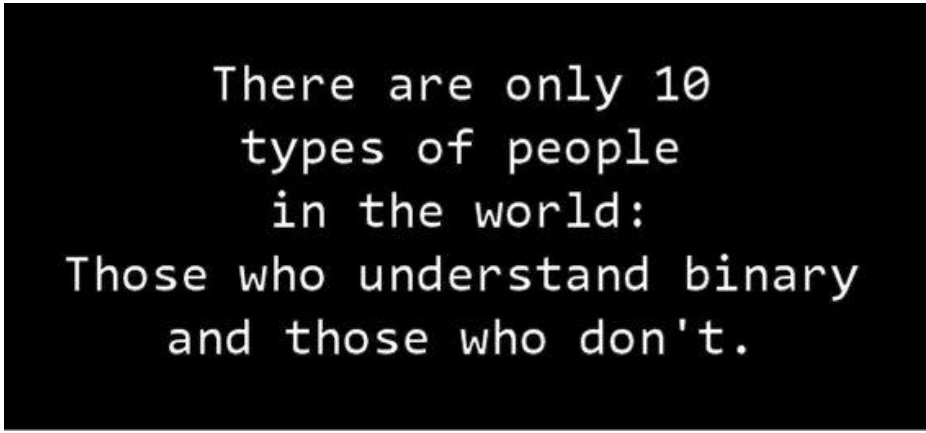
SMART is just advanced DIGITAL.

Binary Digits

There are two digits in the binary system, 1 and 0.

Each digit is called a bit.

Binary + Digit = Bit



Binary Digits

Positive Logic:

High = 1

Low = 0

Negative Logic:

High = 0

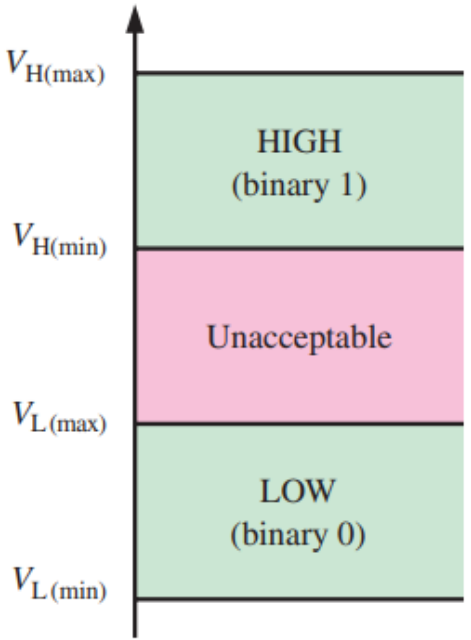
Low = 1

Logic Levels

The voltages used to represent a 1 and a 0 are called logic levels.’

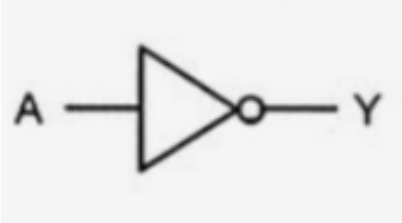
LOW = < 0.8 V

HIGH = 2V – 3.3 V

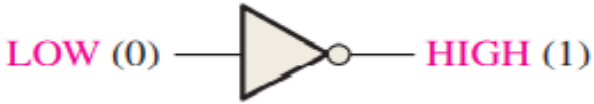


Logic Gates - NOT Gate

!

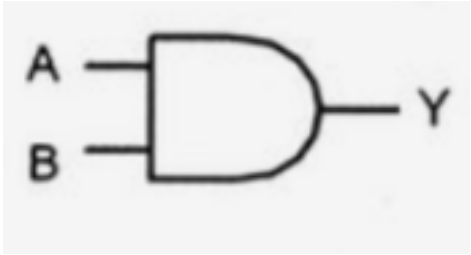


INPUT	OUTPUT
A	
0	1
1	0



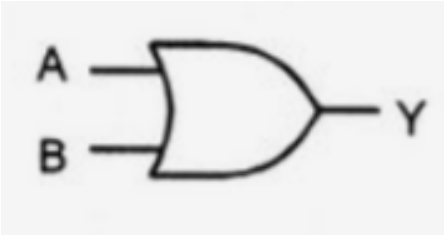
Logic Gates - AND Gate

&&



A	B	
0	0	0
1	0	0
0	1	0
1	1	1

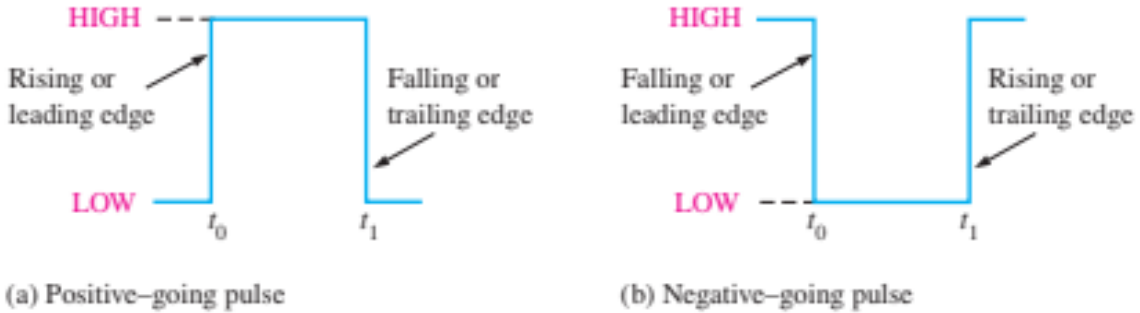
Logic Gates - OR Gate



INPUT		OUTPUT
A	B	
0	0	0
1	0	1
0	1	1
1	1	1

Digital Waveforms

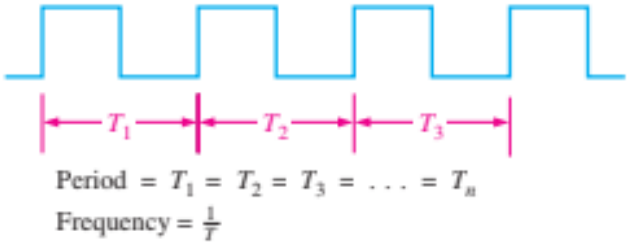
It consist of voltage levels that are changing back and forth between the HIGH and LOW levels or states.



Periodic and Non-Periodic Waves

A periodic pulse waveform is one that repeats itself at a fixed interval, called a period (T).

The frequency (f) is the rate at which it repeats itself and is measured in hertz (Hz).



(a) Periodic (square wave)

(b) Nonperiodic

Waveform Characteristics

The frequency (f) of a pulse (digital) waveform is the reciprocal of the period.

$$f = \frac{1}{T} \qquad \text{Equation 1–1}$$

$$T = \frac{1}{f} \qquad \text{Equation 1–2}$$

Duty Cycle: It is the ratio of the pulse width (tW) to the period (T).

$$\text{Duty cycle} = \left(\frac{t_W}{T}\right)100\% \qquad \text{Equation 1–3}$$

Clock

The clock is a periodic waveform in which each interval between pulses (the period) equals the time for one bit.

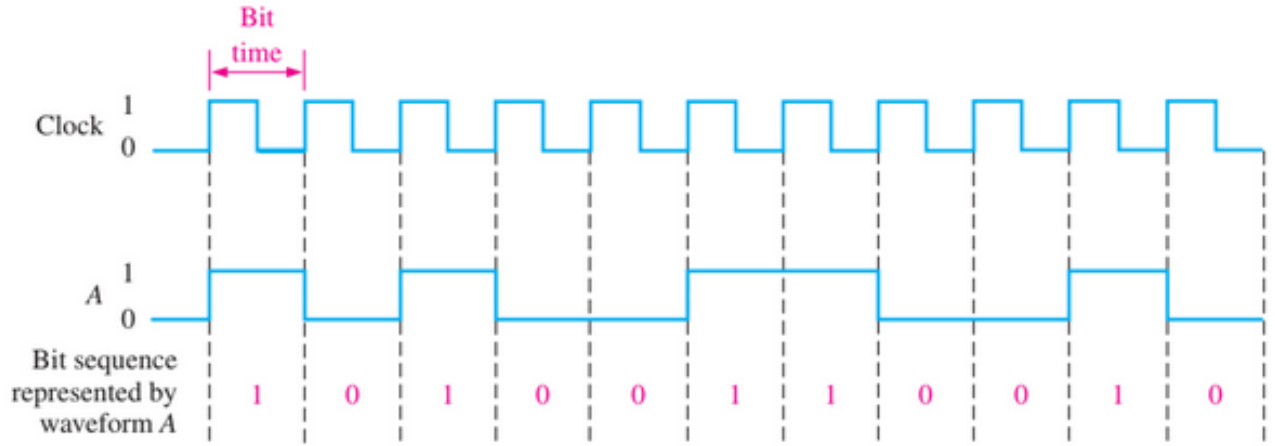
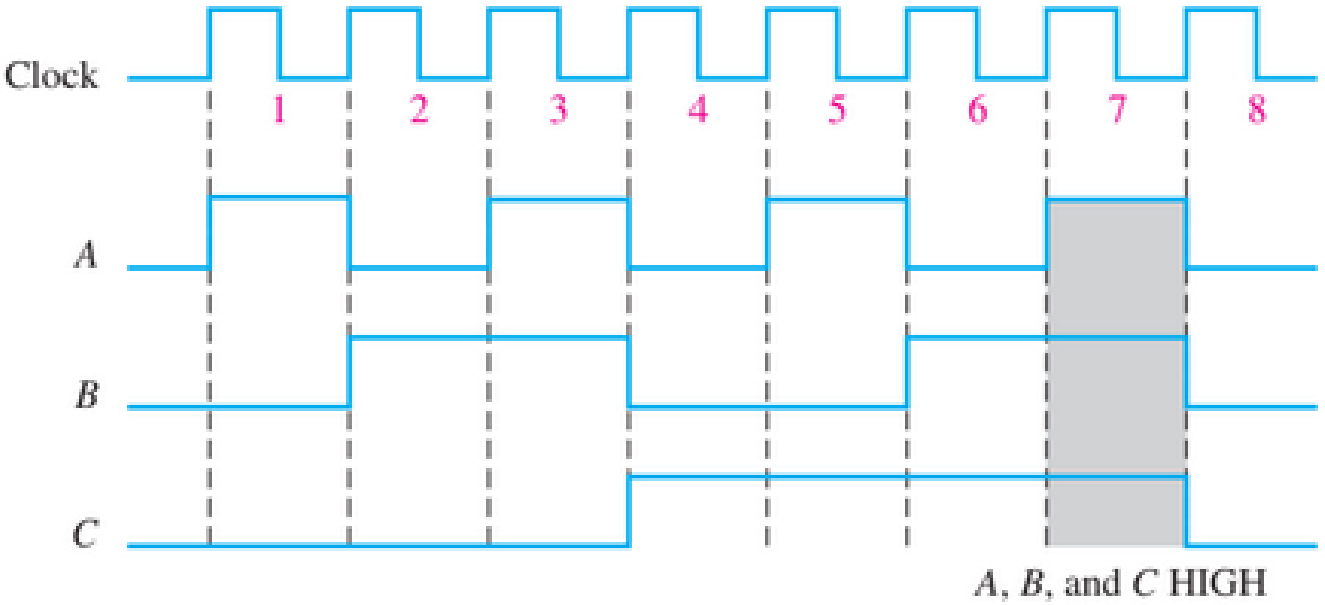
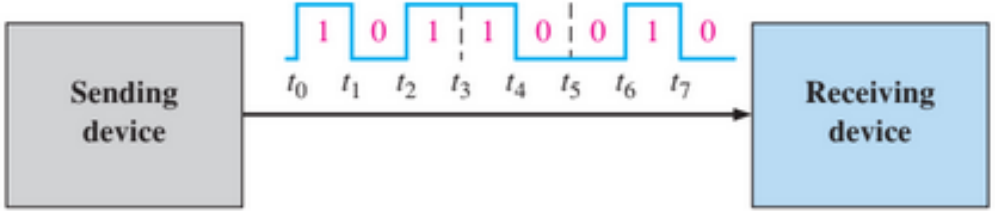


FIGURE 1–11 Example of a clock waveform synchronized with a waveform representation of a sequence of bits.

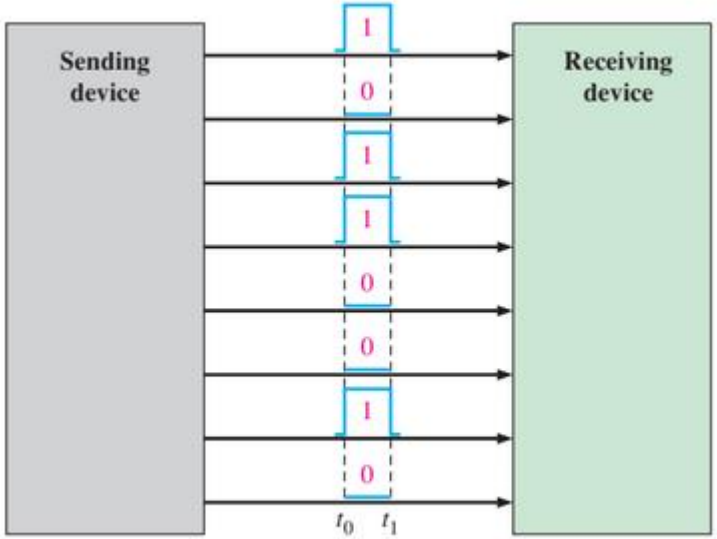
TIMING DIAGRAMS



Data Transfer



(a) Serial transfer of 8 bits of binary data. Interval t_0 to t_1 is first.



(b) Parallel transfer of 8 bits of binary data. The beginning time is t_0.

(a) Determine the total time required to serially transfer the eight bits contained in waveform *A* of Figure 1–14, and indicate the sequence of bits. The left-most bit is the first to be transferred. The 1 MHz clock is used as reference.

(b) What is the total time to transfer the same eight bits in parallel?

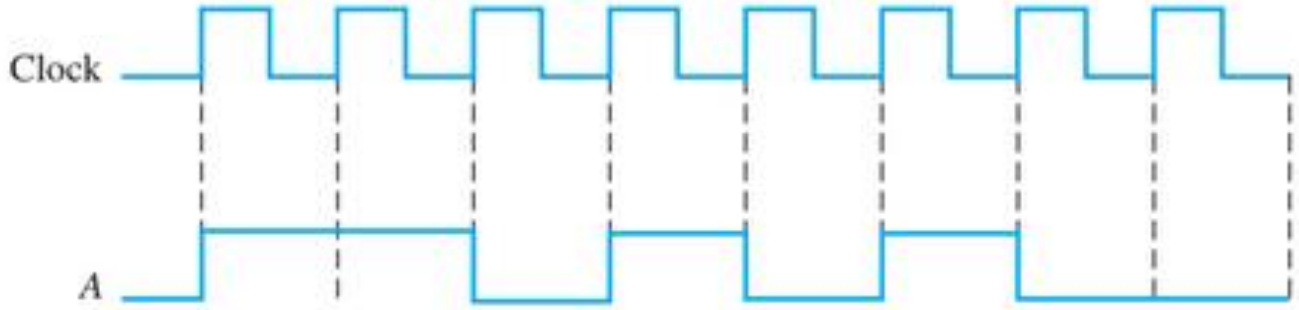


FIGURE 1–14

Since the frequency of the clock is 1 MHz, the period is

$$T = \frac{1}{f} = \frac{1}{1\text{ MHz}} = 1\ \mu\text{s}$$

It takes 1 μs to transfer each bit in the waveform. The total transfer time for 8 bits is

$$8 \times 1\ \mu\text{s} = \mathbf{8\ \mu s}$$

FIGURE 1–15

(b) A parallel transfer would take **1 μs** for all eight bits.