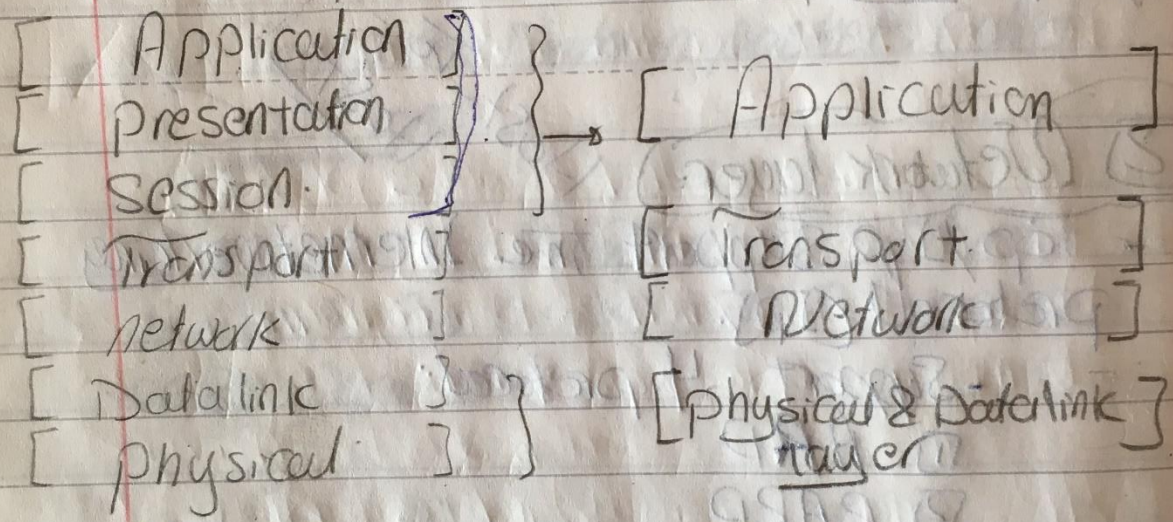
2.4 TCP/IP protocal:

TCP/IP → Transmission Central protocal
/ Internet protocal



OSI Model — 7 layers

TCP/IP — 4 layers

1) physical & Data link layers:

- Tcp/Ip Doesn't Define any specific protocol, It Support all The standard & proprietary protocols..

2) Network layer: (Host-To-Host)

- Tcp/Ip Support The Internetworking protocol (IP).
  - Support 4 protocol.
    1. ARP
    2. RARP
    3. ICMP
    4. IGMP.

(Host-to-Host protocol).

1) Ip (Internetworking protocol)

- Ip is the Transmission Mechanism used by Tcp/Ip protocols.
- Ip is a Best Effort Delivery Services.

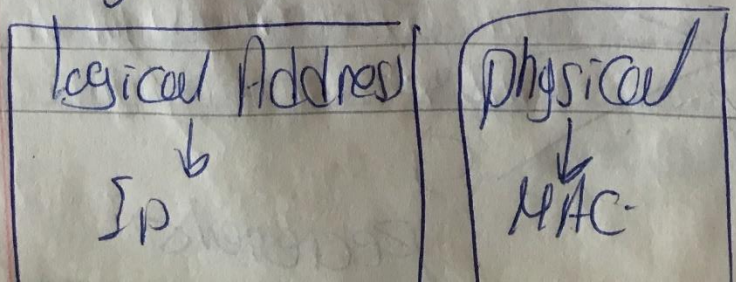
* Best Effort means that IP provides no Error Checking or Tracking.
- IP Transmit packets to the Destination But with No Guarantees.

* IP Transports Data in packets called DataGrams.

Datagrams can Travel along Different Routes & can arrive out of sequence or Be Duplicated.

2) ARP (Address Resolution Protocol).
- ARP is used to associate a logical Address with physical Address.

- ARP is used to find the physical Address of the node when its Internet (logical) Address is known.



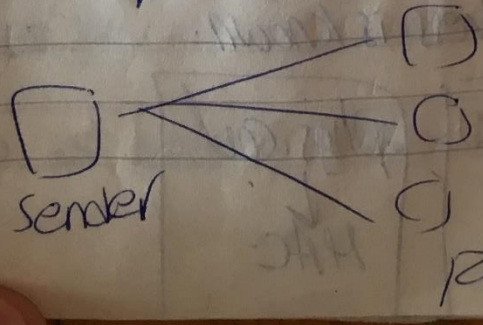
3 Reverse Address Resolution protocol (RARP).
- allow Host to Discover its Internet ~~prot~~ Address when it knows only its physical Address.

- It's used when a Computer is Connected To a Network for The First Time.

4 ICMP (Internet Control Message protocol).
- It is a Mechanism used by Hosts To send Notification of Datagram problems Back to The sender.

ICMP sends Query & Error Reporting Messages.

5 IGMP (Internet Group Message protocol)
- It is used to facilitate The Simultaneous Transmission of a Message to a Group of Recipients (Recievers).



50

3 Transport layer

Process - To - Process

TCP/IP use Two protocols:

1. TCP : Transmission Control protocol.
2. UDP : User Datagram protocol.

Note:

* IP is a Host-To-Host Protocol, meaning that it can deliver a packet from one Device to another.
* UDP/TCP is a Transport layer protocols. Used For Delivery of a Message From a process to another process.
* Three protocols in Transport layer
  1. TCP : Transmission Control protocol
  2. UDP : User Datagram protocol
  3. SCTP : Stream Control Transmission protocol.

① UDP:

1) It is Proces-To-process protocol
2) add only * port number (address)
   * Checksum Error control
   * length to the Data From the Upper layer
3) Connectionless

② TCP

1) TCP is a Relicable Stream Transport protocol
2) connection oriented, Connection must be ~~Stream means~~ established Between sender Both Devices Befer sending Data.

* The Sender Divides The Streams of Data into Smaller unit called segments.

Each segment includes
- Sequence number For Reordering after Recieved, with an acknowledgment number For The segments Recieved

3 SCTP (Stream Control Transmission protocol)

* Provide support for newer Apps such as Voice over the Internet.
* It Combines the best Features of UDP & TCP.

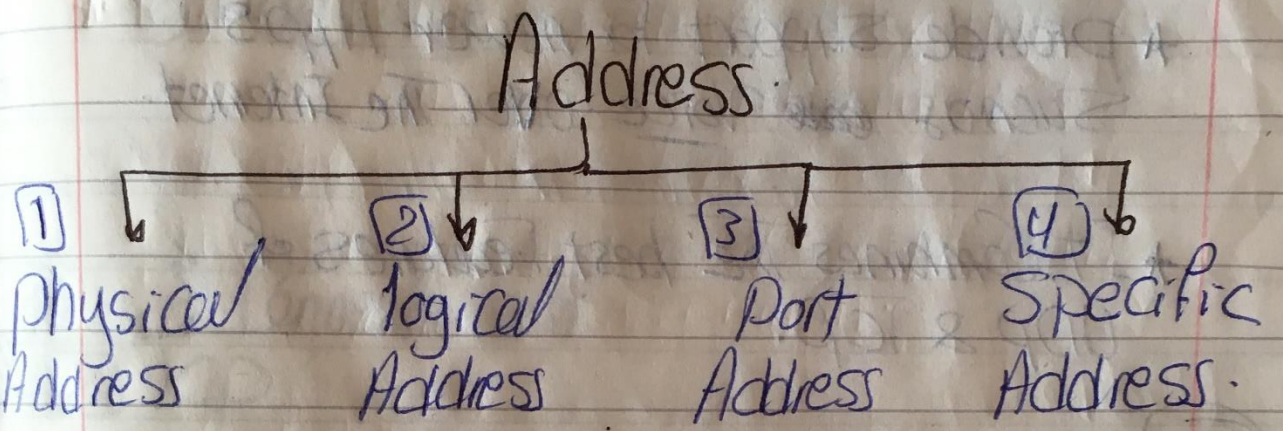
4 Application layer

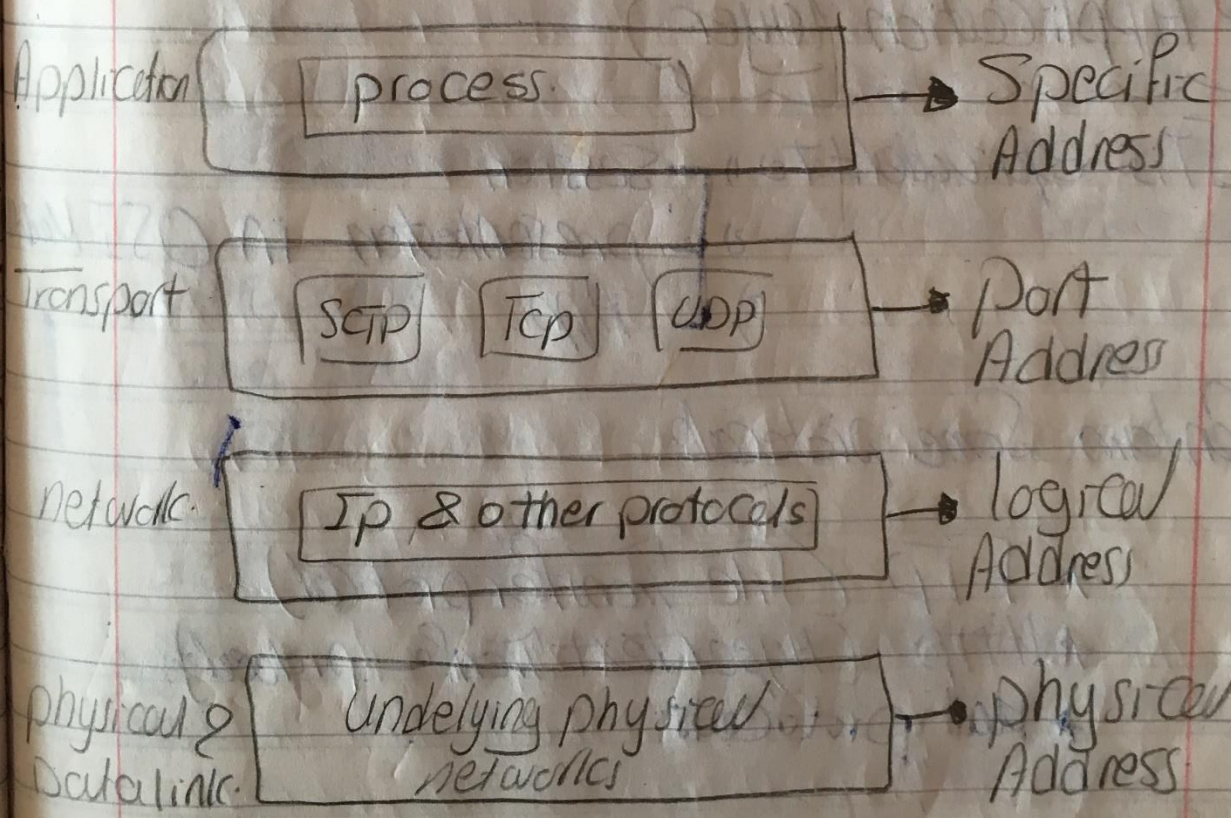
It is equivalent to 1) Session 2) presentation 3) App in OSI Model

Contain Some protocols.

* FTP (File Transfer protocol)
* Http (Hypertext Transfer protocol)
* Mail protocols.

* Addressing


Address
1
Physical Address
2
logical Address
3
Port Address
4
Specific Address


Application
process
Specific Address
Transport
SCTP
TCP
UDP
Port Address
network
Ip & other protocols
logical Address
physical & Datalink
Underlying physical networks
physical Address

1) physical address / (Link address).

- The address of a node as Defined By the LAN/WAN.
- It is included in the frame used By the Data link layer.

Ex. LAN use a 48 bit (6 Byte). 48/8.

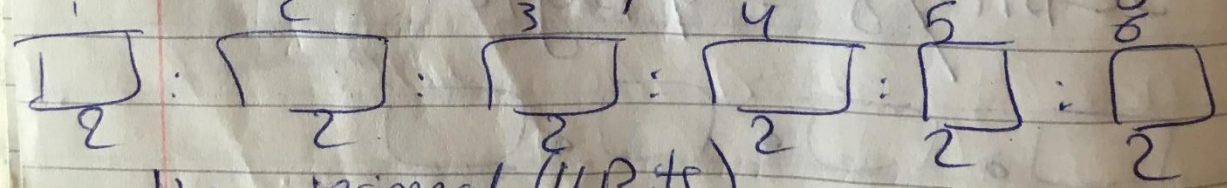
physical addres.

Written as (48/4) = 12 Hexa Decimal.

07 : 01 : 02 : 01 : 2C : 48

* 0000 0111

48 Bits/8 ⟶ 6 Byte.



Hexadecimal (4 Bits)

48/4 = 12 Hexadecimal

(2) Logical Address: (IP address):

* logical Address are necessary for universal communications that are independent of the underlying physical network.
- physical addresses aren't adequate in an internetwork Environment.

logical Address (IP address):

IP (4) ⟶ 32 Bit: 8 Bit | | | |
32/4 = 8 Byte

- logical address can uniquely Define a Host Connected to inderent.

No Two Devices can have the same IP address.

↳ 32 Bits/8 = 4 Byte.

| . | . | . |

(3) Port address.

- IP address / physical address are necessary for a quantity. Data travel from a source to destination Host.

* Computers (Devices) Run multiple processes at the same time.

Each process is defined by port address.

* port address is (16 Bit) length.
  → Hexa
  16/4 = (4)

Ex: 0753

4 Bits 4 Bits 4 Bits 4 Bits

16 Bits / 4 (Hexadecimal)

4 □□□□

4 4 4 4 = (16)

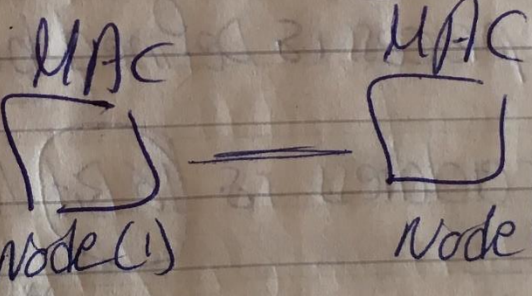
4 Specific address:

* Some Applications have User-Friendly addresses that are Designed For that Specific address.

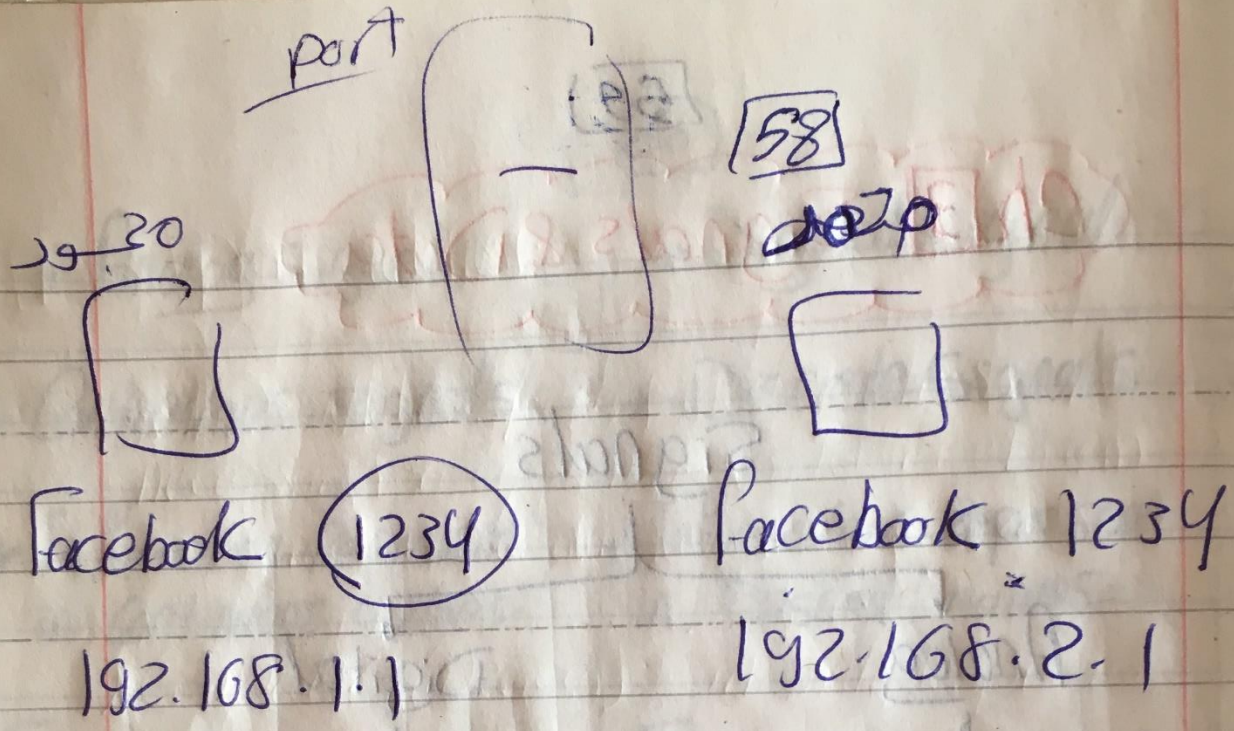
Email.

URL

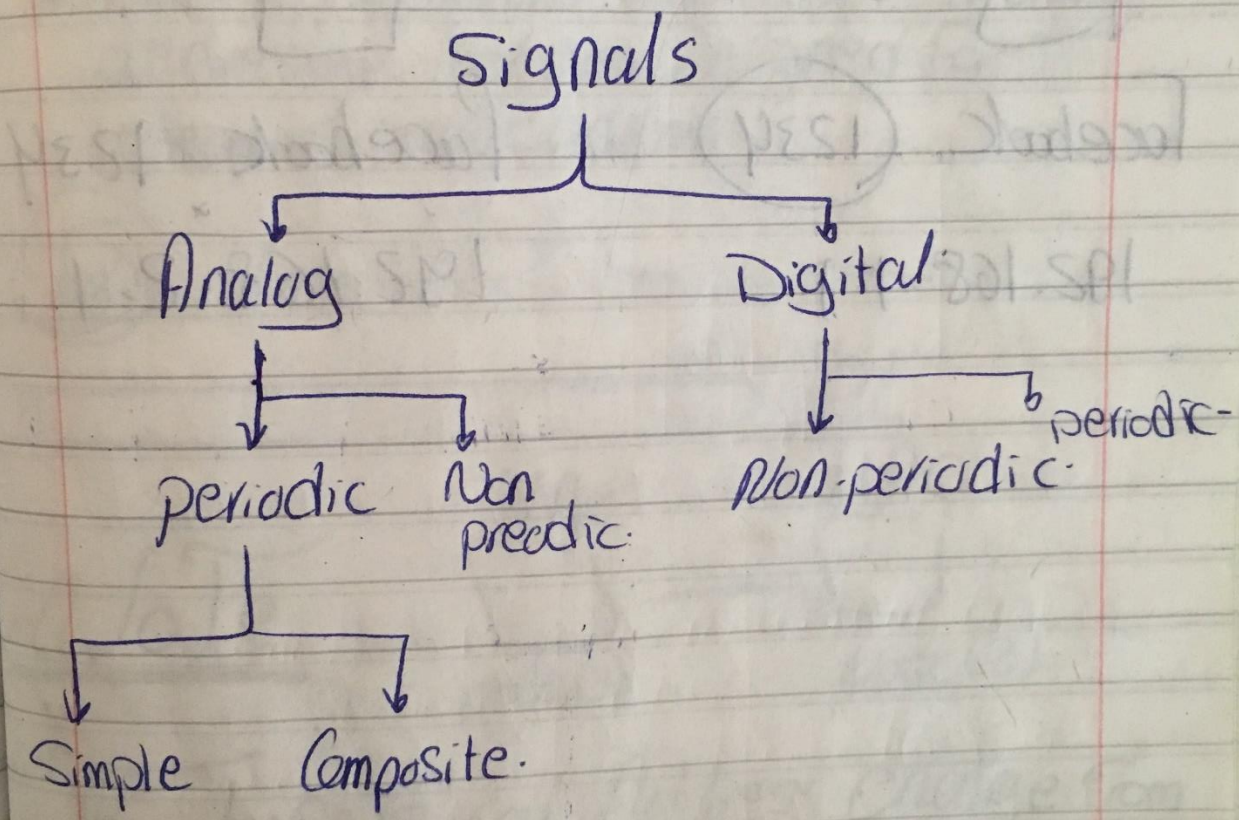
Note



The physical Address change from Hop (Device/Node) to Node But The logical & port Address. Usually Remain The Same


port
58
Facebook 1234
192.168.1.1
Facebook 1234
192.168.2.1

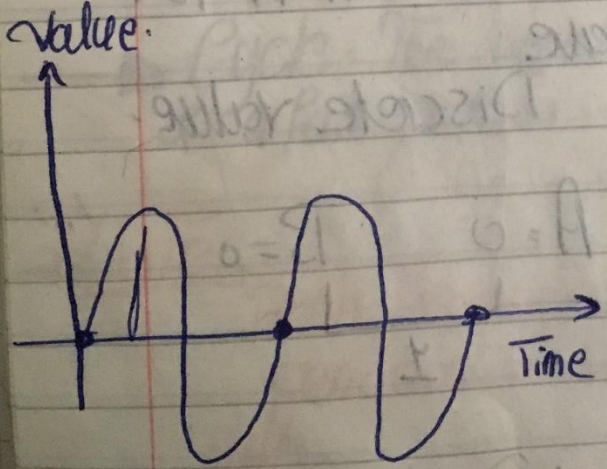
Ch 3 Signals & Data



* Analog signal

* Continuous signals
* Information Represent in Continuous values.

Ex:
Human Voice
→ wave created when Humen speaks.

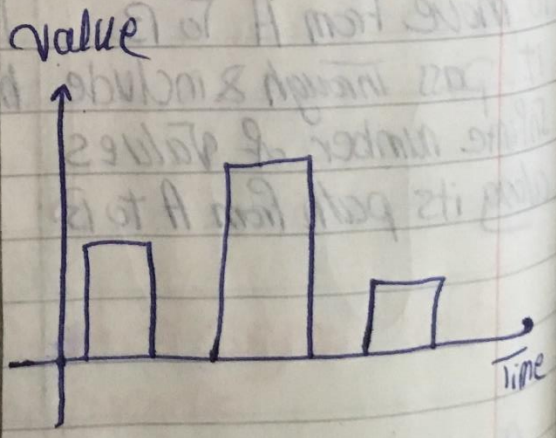


* infinite values.

* Digital signal.

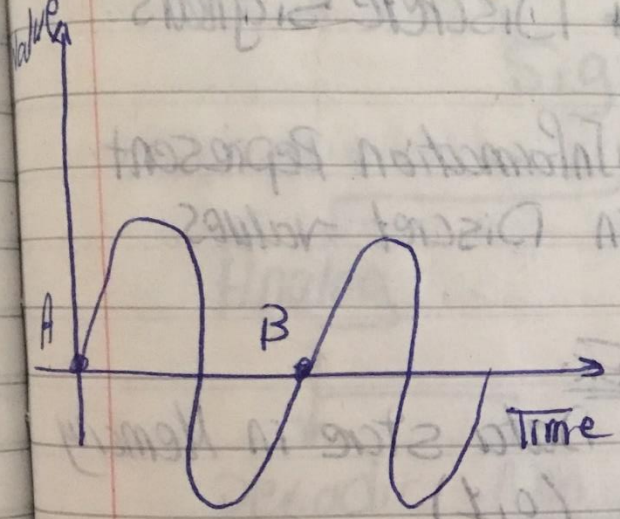
* Discrete Signals
* Information Represent in Discret values.

Ex:
Data store in Memory (0,1)



* Finite values

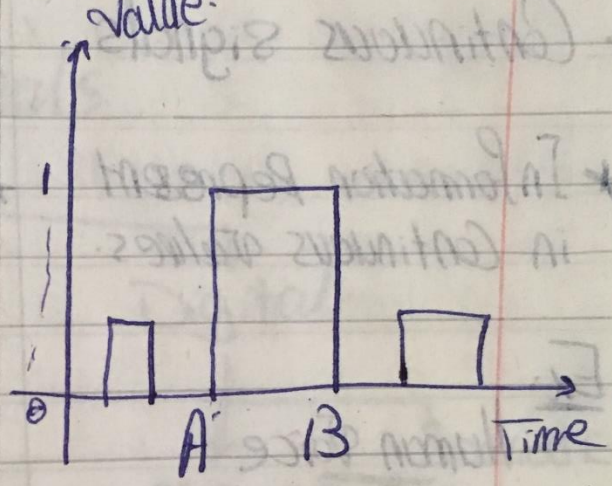
Ex:



To move from A to B it pass through & include infinte number of values along its path from A to B.

* Analog signal have infinte number of values in Ronge

Ex:



To move from A to B. have Discrete value.

A = 0 B = 0

1

* Digital signals can have a limited number of values.

★ Periodic Signal.

★ Complete a pattern within a measurable Time Frame.

→ Timeframe ⟹ period.

★ periodic → means The pattern Repeats over Subsequent identical periods.

→ Cycle: The Completion of a Full pattern

★ Non-periodic Signal

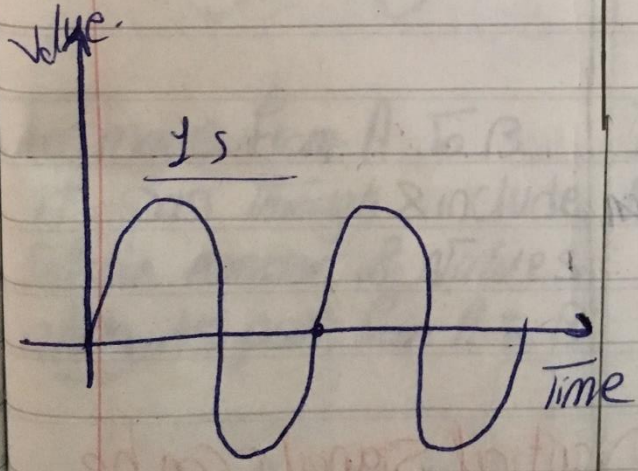
★ Non-periodic signal changes without Exhibiting a pattern or cycle that Repeats over Time.

Note:
Both Analog & Digitial signals can be periodic or Non periodic.

But:
In Data Communications, Commonly use periodic Analog signal & nonperiodic Digital signal.

* Periodic signal:

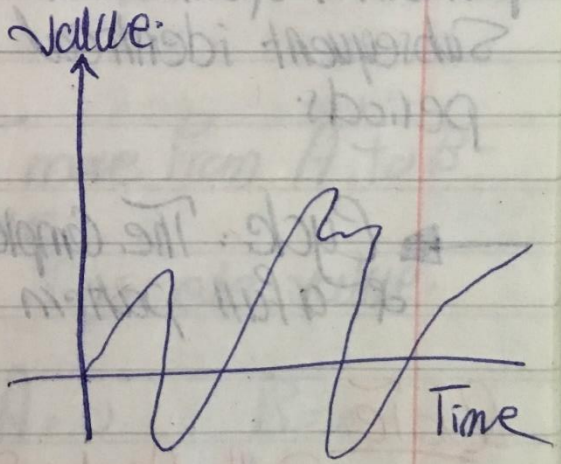
* A signal that Repeats itself (its pattern) after a specific interval of time.



Ex:
Sine wave.

* Non-periodic signal:

* signal doesn't Repeats ~~itself~~ itself (its pattern) after a specific interval of Time.

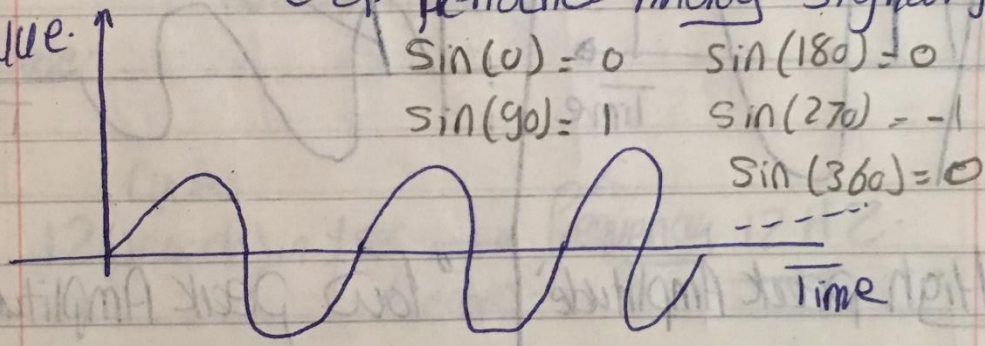


Ex:
Sound wave.

* Periodic Analog signal:

- * Simple
- * Composite.

* Sine Wave (The Most Fundamental form of periodic Analog signal).



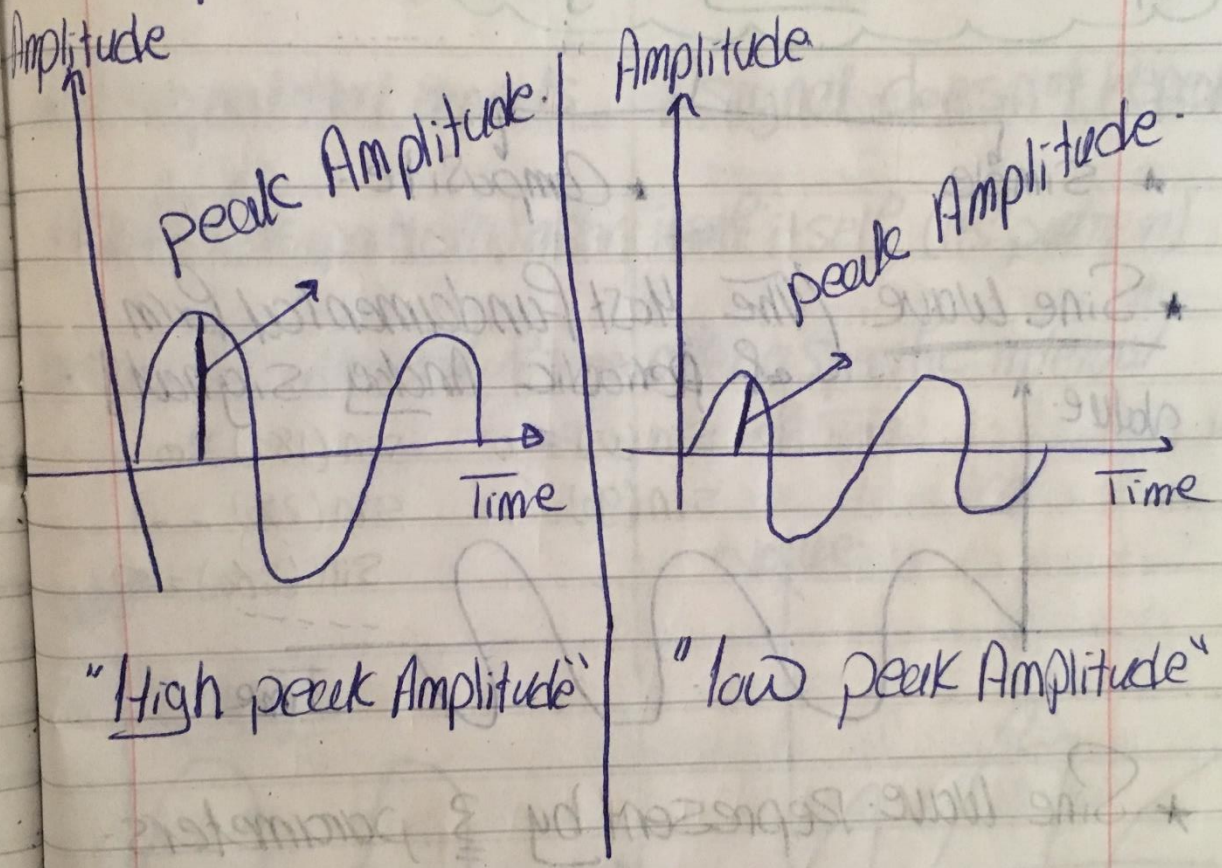
* Sine wave represent by 3 parameters.

1. peak Amplitude
2. Frequency/period
3. phase. (shift).

(1) peak Amplitude :- (أقصى سعة)

↳ The absolute value of its highest Intensity

Amplitude ⟶ Volt



"High peak Amplitude" "low peak Amplitude"

② Period & Frequency

الوقت اللازم عشان أكمل cycle كاملة الوقت

- Period: The Time in second The Signal need to Complete 1 cycle.

عدد الدورات الكاملة في الثانية الواحدة.

- Frequency: The number of periods in 1 sec.

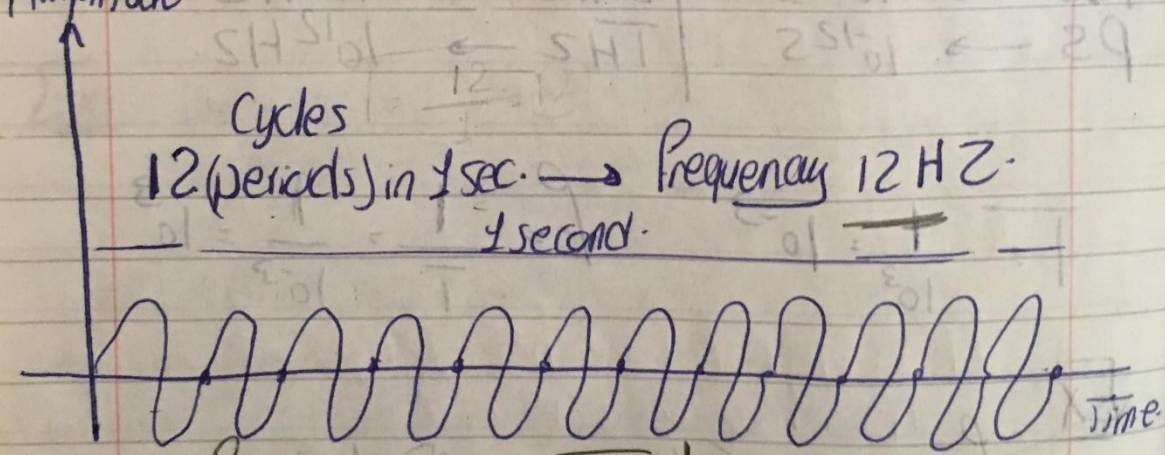
~~Frequency: The number of cycles in 1 sec.~~

* Frequency & period are inverse to each other.

Frequency inverse to period.

$f = \frac{1}{T}$ $\quad T = \frac{1}{f}$

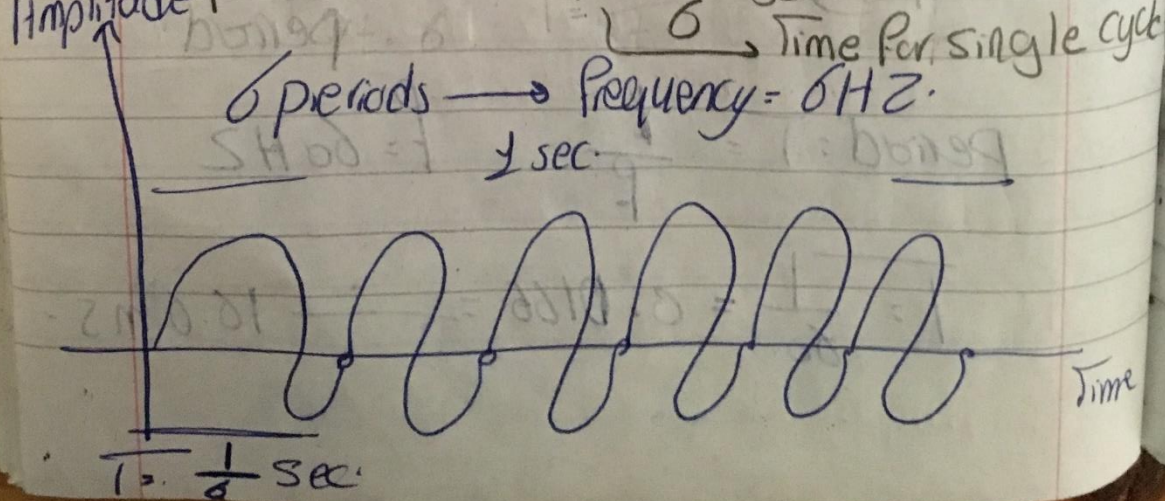
$T \rightarrow$ number of periods



Cycles

12 (periods) in 1 sec. ⟶ Frequency 12 HZ.

1 second. $\quad T$



Amplitude $f = 6$ HZ ⟶ $T = \frac{1}{6}$ sec.

$\frac{1}{6}$ ⟶ Time for single cycle

6 periods ⟶ Frequency = 6 HZ.

1 sec.

$T = \frac{1}{6}$ sec.

period ⟶ seconds

Frequency ⟶ HZ

Periods		Frequency	
Sec	⟶ 1s	HZ	⟶ 1 HZ
ms	⟶ 10^{-3} s	KHZ	⟶ 10^{3} HZ
MS	⟶ 10^{-6} s	MHZ	⟶ 10^{6} HZ
GS	⟶ 10^{-9} s	GHZ	⟶ 10^{9} HZ
PS	⟶ 10^{-12} s	THZ	⟶ 10^{12} HZ.

$$T = \frac{1}{10^{3}} = 10^{-3} \qquad f = \frac{1}{T} = \frac{1}{10^{-3}} = 10^{3}$$

Ex

Frequency = 60 HZ ⟶ Determine period.

$$\text{period} : T = \frac{1}{F} \qquad F = 60\,HZ$$

$$T = \frac{1}{60} = 0.0166 = 16.6\,ms.$$

$1m \xrightarrow{\times 10^2} 100\ cm$

$100\ cm \xrightarrow{\times 10^{-2}} 1m$

Ex:

Express a period of 100 ms in microseconds.

$100\ ms = 100 \times 10^{-3}\ sec \longrightarrow$

$100 \times 10^{-3} \times 10^6 = 10^2 \times 10^{-3} \times 10^6 = 10^5\ \mu s$

$sec \xrightarrow{\times 10^6} \mu s$

Ex: The period of a signal is 100 ms. What is its frequency in kilohertz?

$period = 100ms = 100 \times 10^{-3} s = 10^{-1}\ sec$

$f = \frac{1}{T} = \frac{1}{10^{-1}} = 10\ Hz \times 10^{-3}\ kHz$

$= 10^{-2}\ kHz$

الصغير $\xrightarrow[\times 10^{-3}]{\text{يضرب في السالب}}$ الكبير

Hz $\xrightarrow[\times 10^{-3}]{\text{يضرب في السالب}}$ kHz

الكبير $\xrightarrow[\times 10^{3}]{\text{يضرب في الموجب}}$ الصغير

kHz $\xrightarrow[\times 10^{3}]{\text{يضرب في الموجب}}$ Hz

Note:

Frequency is The Rate of change with Respect To Time.

Change is a short span of Time means High Frequency.

Change over a long span of Time means low frequency.

Note:

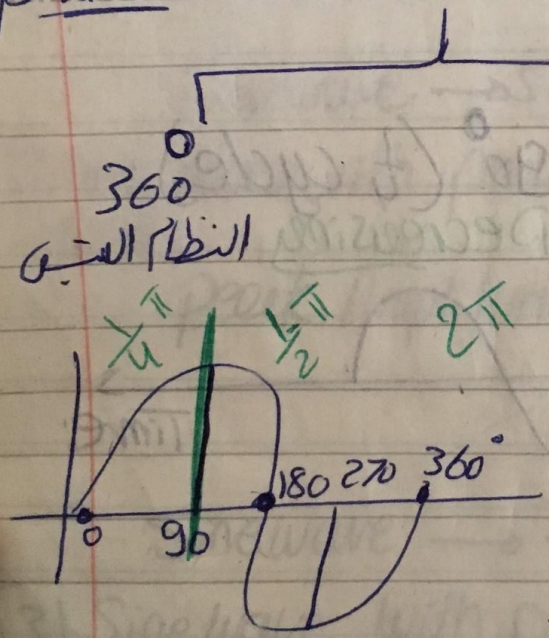
IF a signal Doesn't change at all its Frequency is zero (0)

IF a signal changes instantaneously its Frequency is infinite

3) phase: (shift)

phase: Describes the position of the wave form relative to time 0

phase Describes in



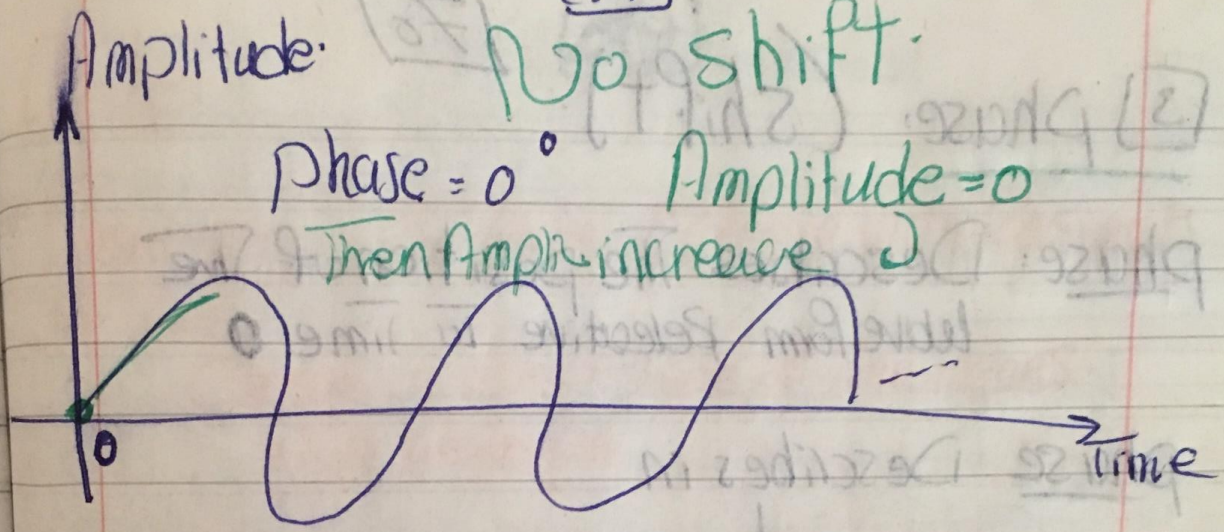
90° = π/2 (Quarter of period (1/4 cycle))

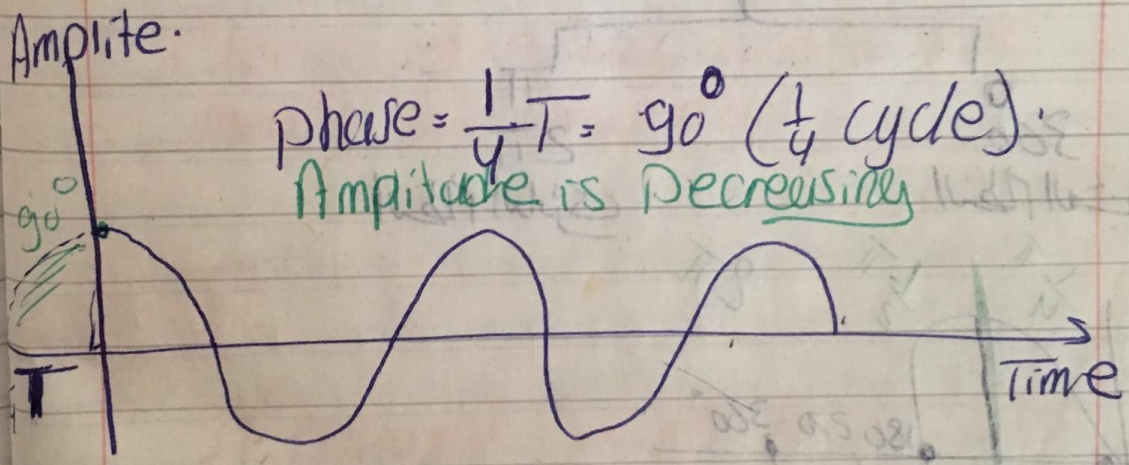
180° = π (Half of period (1/2 cycle))

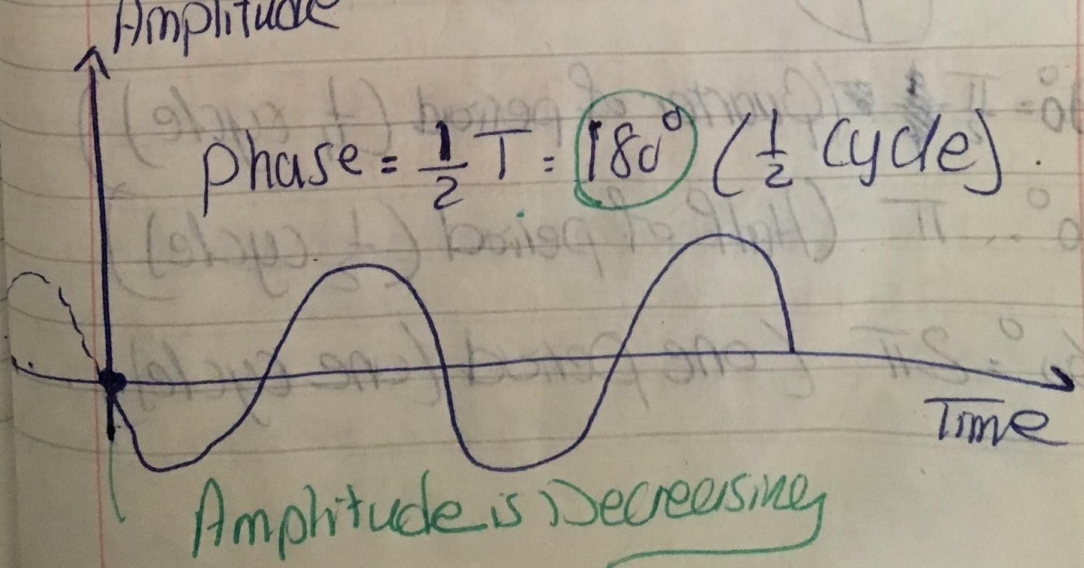
360° = 2π (one period (one cycle))

71

No shift.


Amplitude.
Phase = 0°
Amplitude = 0
Then Ampli. increase
A
0
Time


Amplite.
Phase = 1/4 T = 90° (1/4 cycle).
Amplitude is Decreasing
90°
T
Time


Amplitude
Phase = 1/2 T = 180° (1/2 cycle).
Time
Amplitude is Decreasing

7.2

Sinewave ⟶ Not shifted.

1. Sinewave with phase 0° starts at Time 0 sec
   Zero Amplitude

   The Amplitude is increasing ⟵

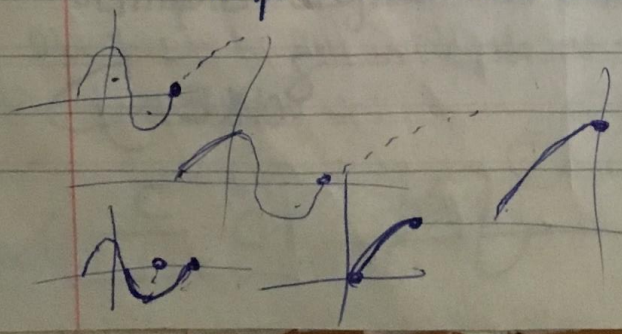
Sinewave ⟶ shifted 90°

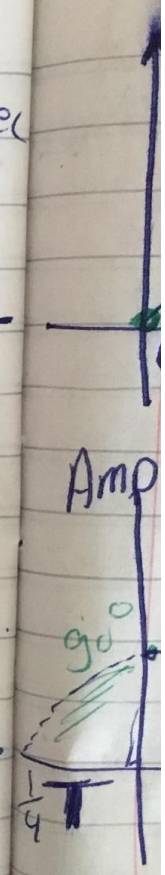
2. Sinewave with phase 90° stat at Time 0
   with
   peek Amplitude The Amplitud is
   Decreasing ⟵

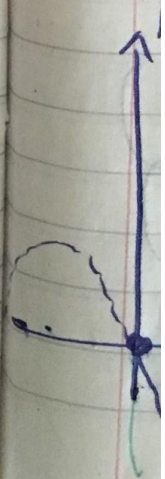
Sinewave ⟶ shifted 180°

3. Sinewave with phase of 180° starts at
   Time 0 with zero Amplitude.

   The Amplitude is Decreasing ⟵







Ex:

1 Complete cycle is 360° Therefore $\frac{1}{6}$ cycle

1 cycle = 360 $\quad \frac{1}{6}$ cycle $= \frac{1}{6} \times 360 = 60°$

$60° \longrightarrow \frac{\pi}{3} = \frac{180}{3} = 60°$

$\lambda \longrightarrow m$

Wavelength (الطول الموجي)

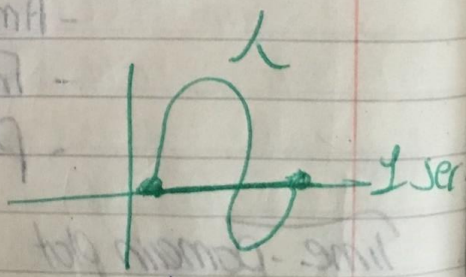
- another characteristic of signal Traveling Through a Transmission Medium.

Wavelength = propagation speed × period

$$\text{period} = \frac{1}{\text{Frequency}}$$

$$\text{Wavelength} = \frac{\text{speed}}{\text{Frequency}} \quad (\text{speed of light})$$

$$\lambda = \frac{c}{f} = c \cdot T$$



Wavelength: is The Distance that a simple signal Can Travel in one period.

المسافة اللي الـ signal بتقطعها في زمن دوري واحد

$C = 3 \times 10^8$

$\lambda = \frac{c}{f} = c \cdot T$