# CN Assignment-1

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1) Explain functionality of each layer in OSI model

i) Application Layer

- File transfer, access and management: This layer allows a user to access the files in a remote computer, to retrieve the files from a computer & to manage files
- Mail Services: Facility for email forwarding & storage is provided
- Directory Services: An appn provides the distributed database source & is used to provide that global info abt various objs

ii) Presentation Layer

- Translation: It handles the interoperability b/w the diff encoding methods
- Encryption &
- Compression

iii) Session Layer

- Dialog control: It acts as dialog controller that allows the communication b/w 2 processes which can be either half or full duplex.
- Synchronization: It adds some checkpoints when transmitting data in seq. If some error occurs, the transmission will take place again from checkpoint

iv) Transport Layer

- Service-point addressing: This layer transmits the message to the correct process. TL adds the header that contains the address known as a port address or service point address

• Segmentation and reassembly: When the transport layer receives the message from upper layer, it divides the message into multiple segments & each seg is assigned with seq number that uniquely identifies each segment. The msg reassembles based on their seq no.

• Connection Control: Transport layer provides 2 services connection-oriented & connectionless service.

• Flow control

• Control control

v) Network. ~~Transport~~ Layer

• Internetworking: Network Layer provides a logical connection between different devices.

• Addressing: A N|w layer adds the source and desti address to the header of the frame. It is used to identify the device on the internet.

• Routing: It determines the best optimal path out of the multiple paths.

• Packetizing: N|w layer receives the packet from upper layer and converts them into packets. Achieved by Internet protocol.

vi) Data Link Layer

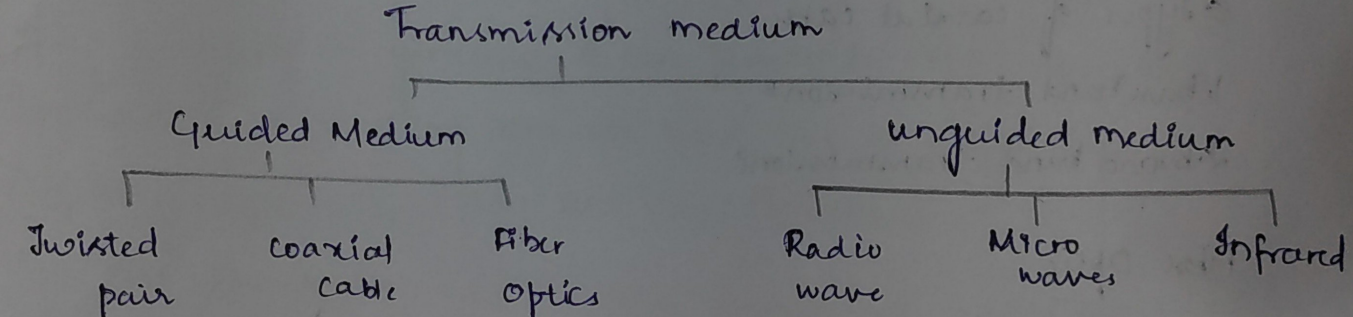
• Framing: The frame is transmitted to the destination address mentioned in the header.

• Flow Control, Error Control, Access Control.

vii) Physical Layer.

- Line Configuration : It defines the way how 2 or more devices can be connected physically.
- Data Transmission : It defines the transmission mode whether it is simplex, half or full duplex mode b/w 2 devices on the N/w.
- Topology : It defines the way how N/w devices are arranged.
- Signals : It determines the type of the signal used for transmitting the info

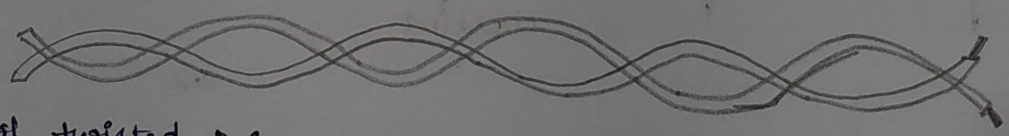
2. Explain about various transmission medium in physical layer with diagram




Guided Media

Twisted Pair

It is a physical media made up of a pair of cables twisted with each other. It consists of 2 insulated copper wires arranged in a regular spiral pattern.

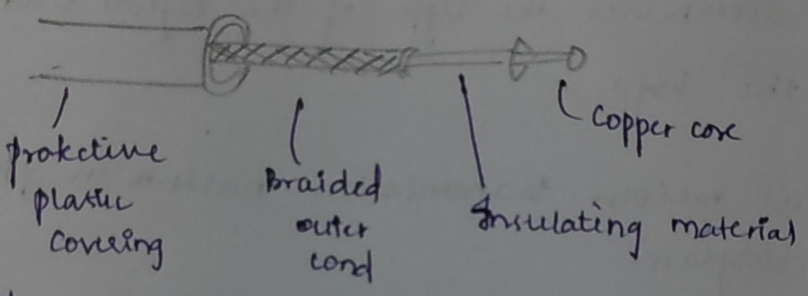


Types of twisted pair

1) Unshielded twisted pair - widely used in telecommunications
2) Shielded twisted pair. - It is a cable that contains the mesh surrounding the wire that allows the higher transmission rate.

## Coaxial cable

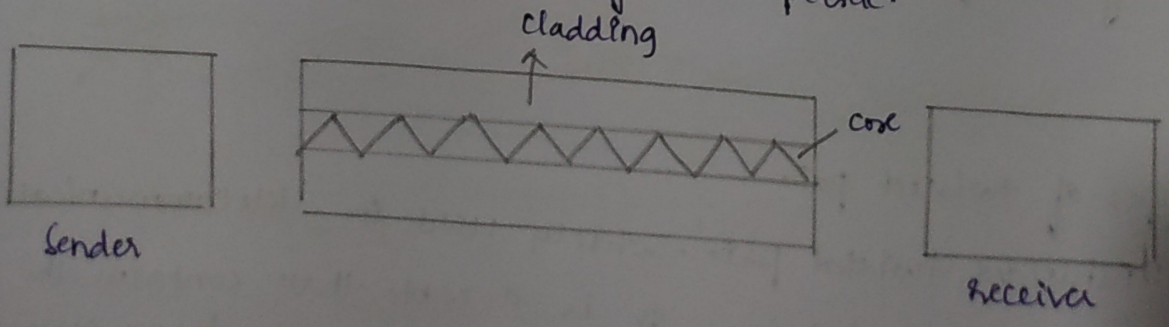
It is very commonly used transmission media, it contains 2 conductors tied to each other It has a higher frequency as compared to twisted pair cable.
The inner conductor of the coaxial cable is made of copper & outer conductor is made up of copper mesh. The middle is made up of non-conductive copper & is responsible for the data transfer & Cu mesh prevents from EMI

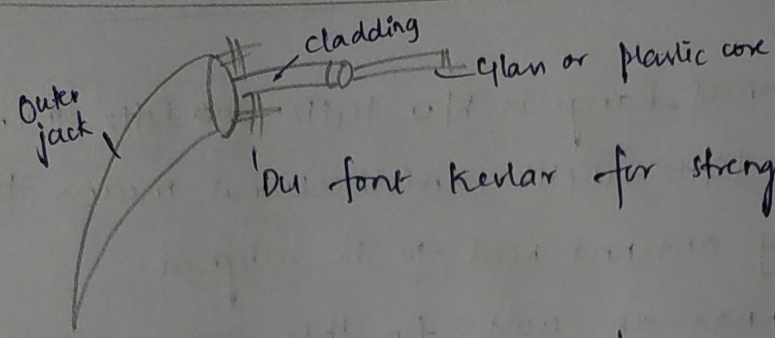



- Types of coaxial cable
1. Base band transmission
2. Broad band transmission

## Fibre Optic

It is a cable that uses electric signals for communication. It is a cable made up of glass or plastic and transmits signal in the form of light.
The fibre consists of cladding & core.
Optical fibre uses reflection to guide light thro' a channel. The cladding is made of less dense glass or plastic.






Propagation modes

- Single mode
- Multimode
  - Step Index
  - Graded index

Unguided Media

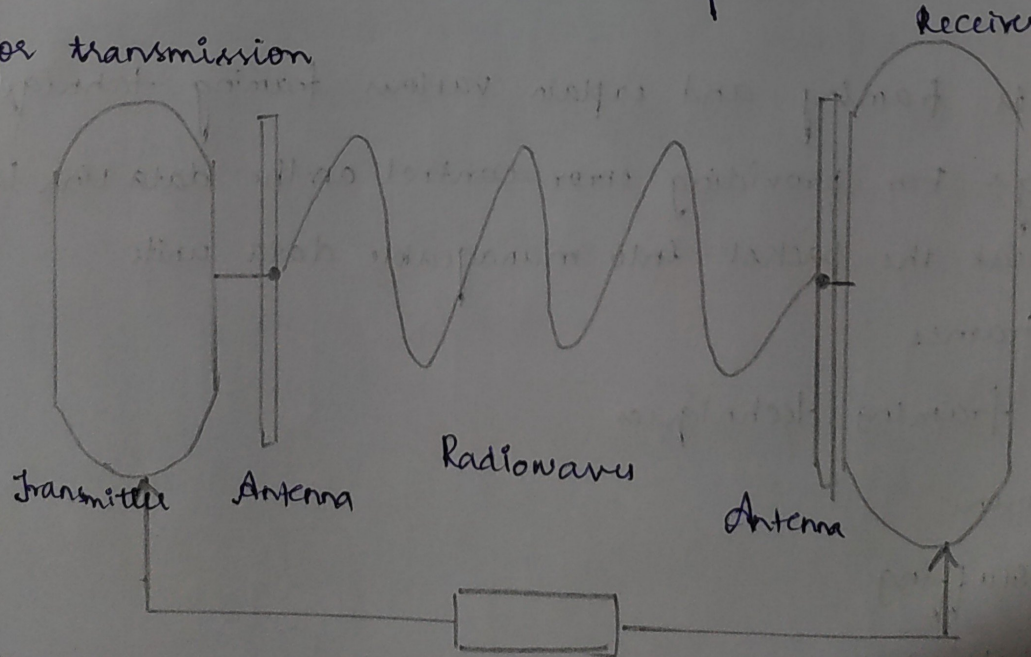
i) Radio waves

These are easy to generate & can penetrate through buildings.

The sending & receiving antennas need not be aligned.

Freq Range: 3KHz–1GHz. They are omnidirectional.

Am and FM radios and cordless phones use radio waves for transmission




Further categorized as

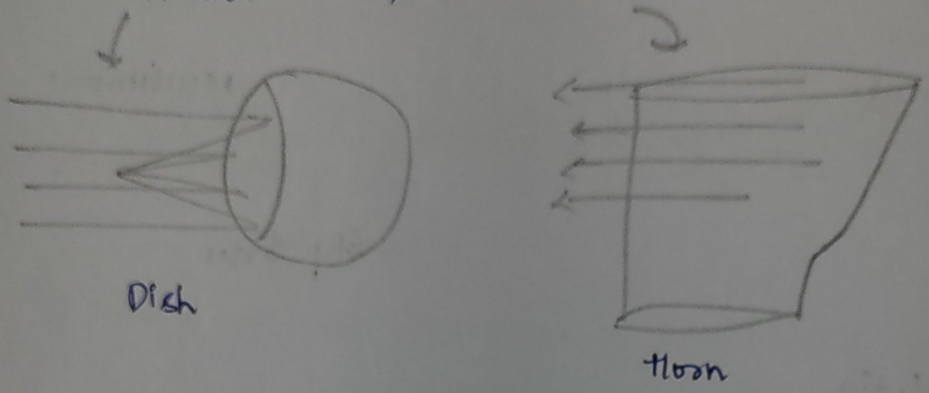
(i) Terrestrial (ii) Satellite.

ii) Microwaves

It is unidirectional. Range is b/w 1GHz-300 GHz. Microwave having freq b/w 1GHz-30GHz, unidirectional means that sending & receiving antenna need to be aligned.

2 types of antennas are used for this communication

1) Dish antenna 2) Horn antenna




iii) Infrared signals

It uses the freq 300 GHz to 400THz

They use wavelength 1mm - 770nm, can be used for short range communication upto few meters

Ex:- TV, Infrared radiations, remote

3) What is framing and explain various framing techniques.

Framing :- For providing error control the data link layer will break the packet into manageable data units called frames

Various framing techniques

i) Byte count

ii) Byte stuffing

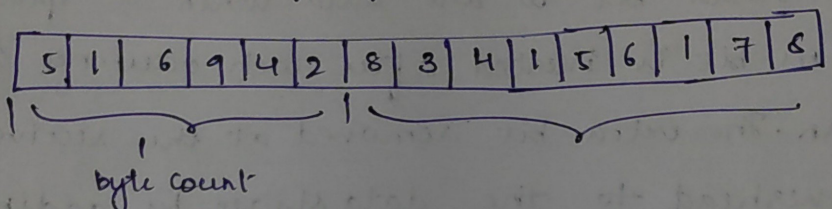
iii) Bit stuffing

iv) Physical layer coding violations

## Byte Count

This method uses a field in the header to specify the number of bytes in the frame when the DLL at the destination sees the byte count, it knows how many bytes follow & hence where the end of the frame is.

byte count - count no. of bytes the frame contains

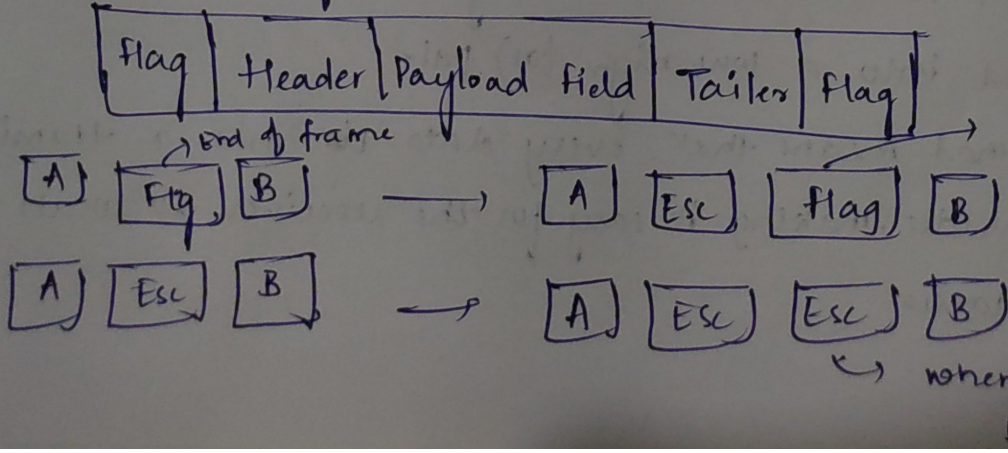


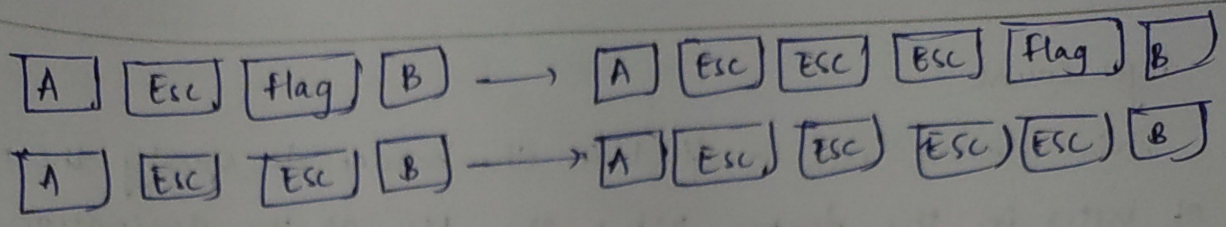

This method is not valid when channel is prone to errors

## ii) Byte Stuffing (flag bytes)

It is a byte which has a predefined bit pattern which is added to the data section of the frame when there is a ~~same~~ Character with the same pattern as the flag. Whenever the receiver encounters the esc character, it removes it from the data section and treats the next character as data, not a flag.

But the problem arises when the text contains one or more escape characters followed by a flag. So, the escape characters that are part of the text are marked by another escape character i.e the esc char is part of the text, an extra one is added to show the 2nd one is part of the text.



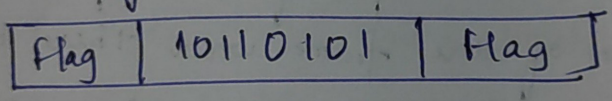



Flag bits with bit stuffing

It is a technique used to prevent the occurence of a specific bit sequence in a data stream by inserting an additional bit. Adds an extra bit to the data when a special bit is found. Extra bit is inserted after each occurence of the flag bit pattern. The extra bit removed at the receiver end

Adds overhead to the data stream by adding an extra bit for every occurence of the specific bit sequence

The specific bit is replaced with a unique bit seq that indicates the original bit sequences value




01111110 01111110

Physical layer encoding violations

This method is used only in those N/w's in which encoding on the physical medium contain some redundancy

Some LANs encode each bit of data by using 2 physical bits that Manchester coding uses

Here Bit 1 is encoded into a high-low(10) pair & Bit 0 is encoded into a low-high (01) pair.

This method means that every data bit has a transition in the middle, making it easy for the receiver to locate the bit boundaries.

Q) Explain CRC with suitable example.

CRC is also called as polynomial course (since it works on polynomial data)

A core bit frame is regarded as coefficient list for a polynomial with k-terms $\{x^{k-1}, x^{k-2} \ldots x^0\}$

Ex: 110001 (k=6 k-1=5)

$1x^5 + 1x^4 + 0x^3 + 0x^2 + 0x + 1 \cdot x^0 = x^5 + x^4 + 1$

When we perform arithmetic operation on polynomial we perform modulo-2 (+,−) [i.e, add$^n$ & sub gives same results] when the polynomial code method is employed, the sender and receiver must agree upon generated polynomial.

Both low and high order bits must be 1.

To complete CRC for some frame with m bits corresponding to the polynomial of $M_x$ must be longer than generator.

Let r be the degree of g(x), append r redundant bits

so codeword length = m+r

Divide $x^r[m(x))$ with g(x) using modulo-2 division

Ex: data word → 1101011111

$G(x) = x^4 + x + 1 \Rightarrow 10011$

```
10011)1101011111(11000
      10011
      -----
       10011
       10011
       -----
       00001111
          10011
          -----
          01100
           10011
           -----
           00110
```

Code word => 11010111110010

↳ sent to receiver.

Q) Write in detail about sliding window protocol.

It is a technique for sending multiple frames at a time.

It controls the data packets b/w the 2 devices where reliable & gradual delivery of data frames is needed.

Here, each frame has sent from the seq numbers, the seq nos are used to find the missing data in the receiver end.

This technique is used to avoid duplicate data.

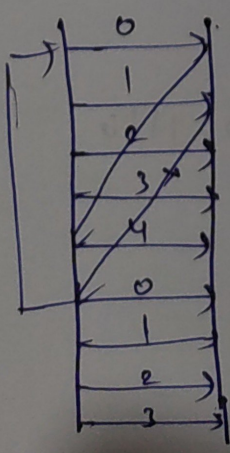
It has 2 types:

1. Go-Back-N ARQ
2. Selective repeat ARQ.

Go-Back-N-ARQ

It is a DLL protocol. In this, if any frame is corrupted or lost all subsequent frames have to be sent again

If the receiver receives a corrupted frame, it cancels it. The receiver doesn't accept a corrupted frame. When the timer expires, the sender sends the correct frame again



## Selective repeat-ARQ

It is DLL protocol. We use this method if there are lot of errors in the frame, lots of bandwidth loss in sending the frames again.

If the receiver receives a corrupt frame, it does not directly discard it. It sends a -ve acknowledgement to the sender. The sender sends that frame again on receiving -ve acknowledgement. There is no waiting for any time-out to send that frame.

Q) Explain about various CSMA techniques.

A) CSMA - Carrier Sense multiple Access.

This method was developed to ↓ the chances of collisions when 2 or more stations start sending their signals over the DLL. CSMA requires that each station 1st check the state of the medium before sending.

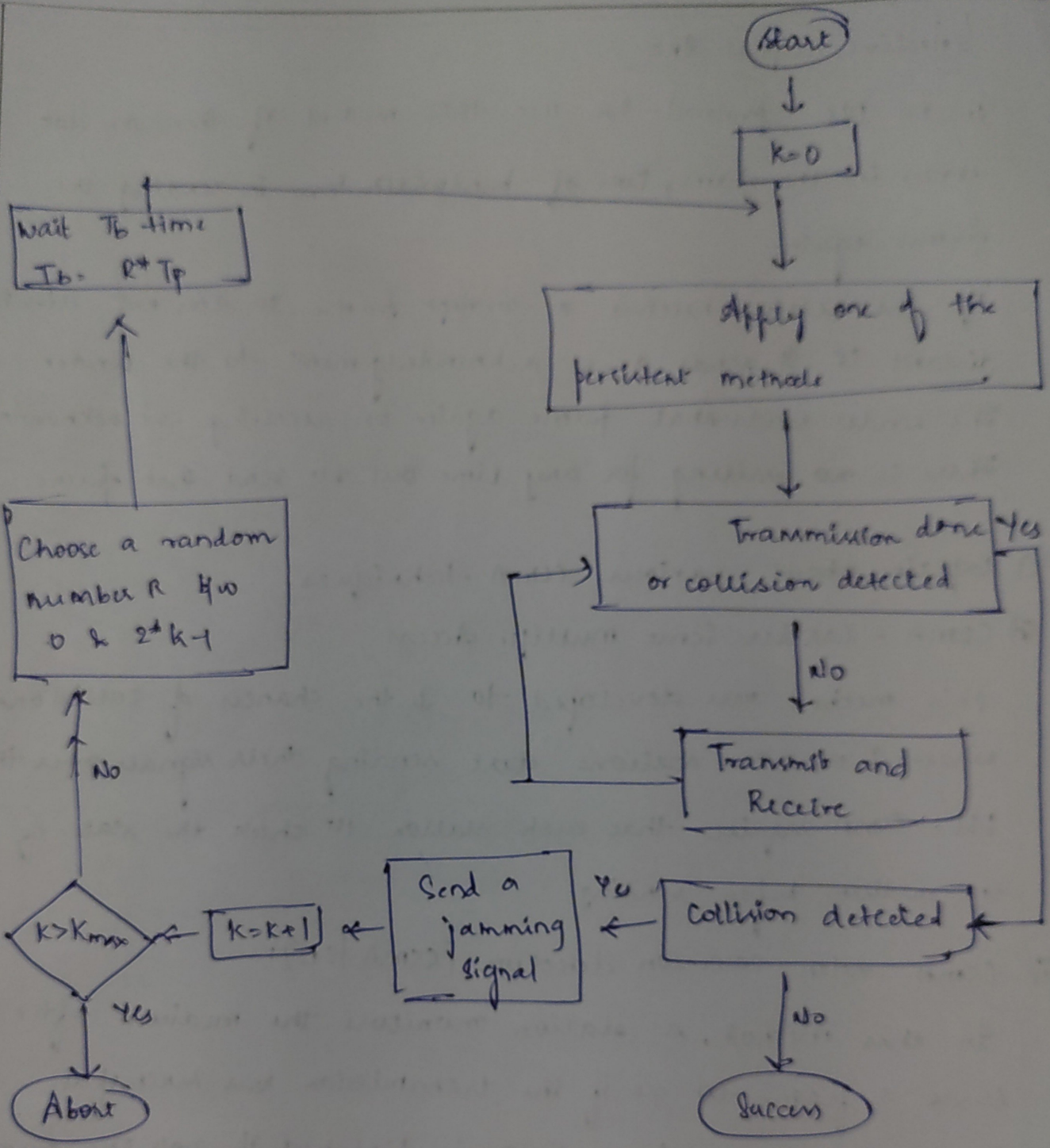
→

ii) CSMA with collision detection (CSMA/CD):

In this method, a station monitors the medium after it sends a frame to see if the transmission was successful.

If successful, the transmission is finished if not the frame is sent again.

The frame transmission time should be at least twice the max propagation time




ii) CSMA with collision Avoidance (CSMA/CA)

Here the station should be able to receive while transmitting to detect a collision from diff stations. In wired N/w's, if a collision has occured then the energy of the received signal almost doubles & the station can sense the possibility of collision.

In the case of wireless N/w's, most of the energy is used for transmission.

Process