ASSIGNMENT - 1

1a) Explain about TCP / IP Protocol

A) Transmission Control Protocol / Internet Protocol. It has 5 layers they are :-

1) Application layer
2) Transport layer
3) Internet layer
4) Network access layer
5) Physical layer

→ Physical layer :-

* Concerned with the physical interface between Computer & network. It is Concerned with issues like

1) Characteristics of transmission
2) Signal levels
3) Data rates
4) Other related matters

→ Network access layer :-

* Concerned about exchange of data between end system and attached network

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Concerned with issues like :-

i) destination address provision

ii) Invoking specific services like priority

iii) accessing to and routing data across the network link b/w two attached systems

→ Internet Layer :-

The internet protocol (IP) is used at this layer to provide the routing function across multiple layers.

→ Transport Layer :-

Common layer shared by all applications

Ensures that the data is arrived at the destination in the same order in which it is sent.

TCP is the commonly used protocol

→ Application layer :-

Provides support for user applications i.e it contains the logic needed to support various user application

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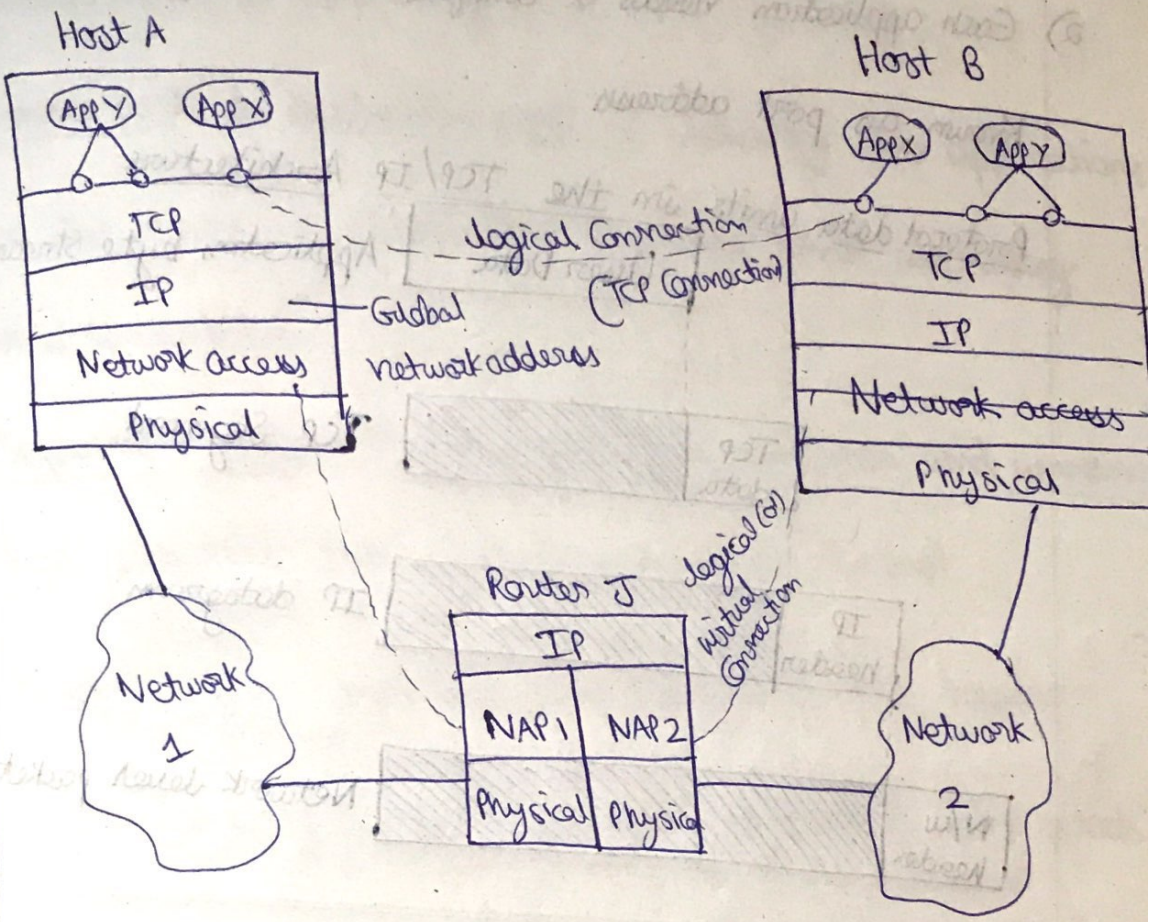
Operation of TCP/IP



IP is implemented in all of the end systems and the routers it acts as a relay to move block of data from one host, through one or more routers to another host. TCP is implemented only in the end systems. It keeps track of the blocks of data to assure that all are delivered reliably to appropriate application.

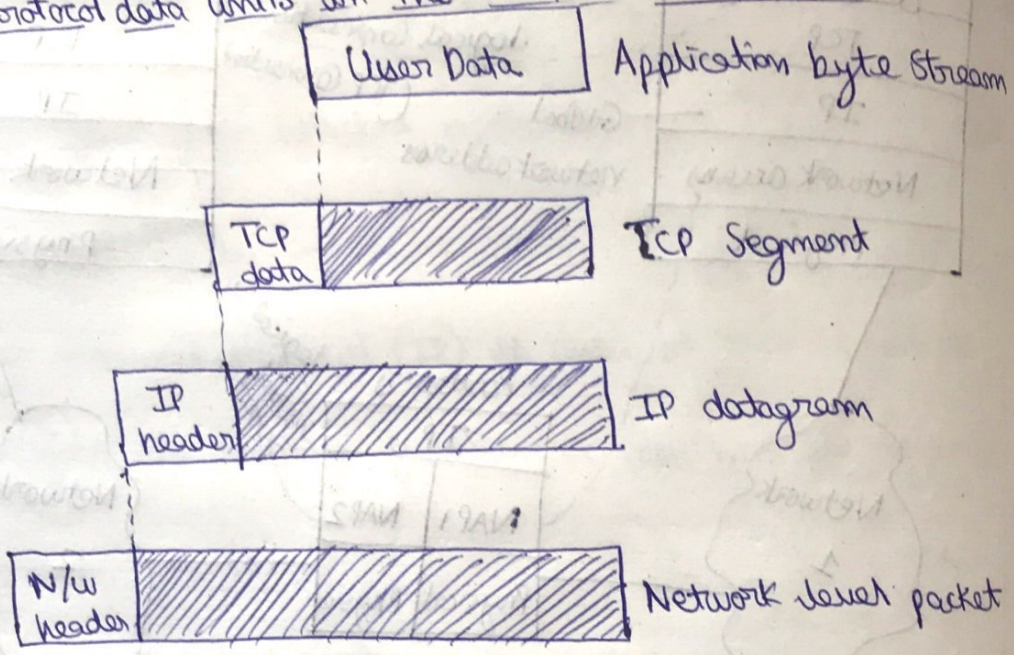
Two levels of addressing are required.

1) Each host requires a unique global network address

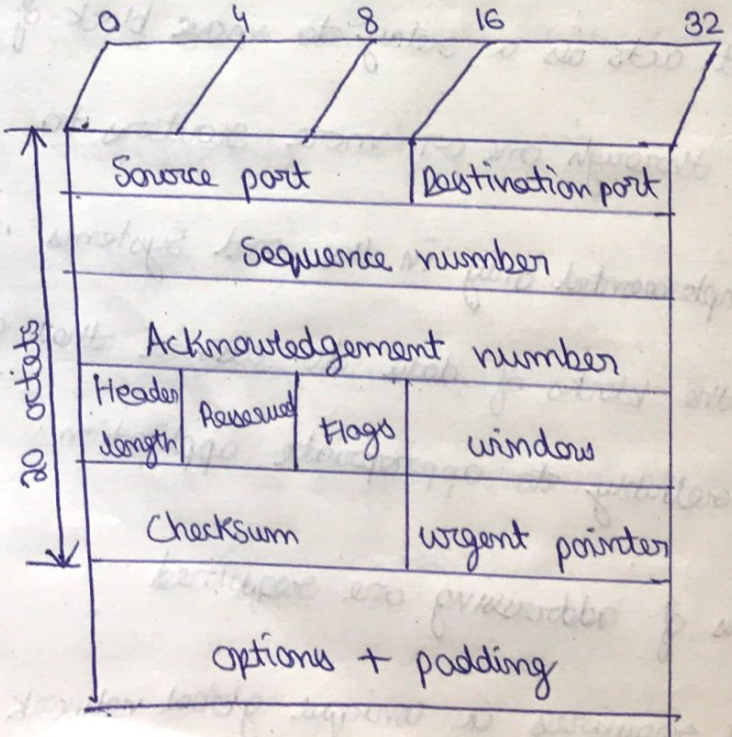
called its IP address

2) Each application needs a unique address within the host known as port address.

Protocol data units in the TCP/IP Architecture



b) Discuss TCP Header



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The above figure shows the header format for TCP which is 20 octets in the length (20 x 8 = 160 bits)

Source port & Destination port : Identify the applications at the source & destination systems that are using this connections.

Sequence number, Acknowledgement number and window field provides flow control and error control

header length indicates the length of the header

Window (16 bits) → Contains the number of data octets

CheckSum is a 16 bit Frame Check Sequence (FCS) used to detect errors in the TCP Segment.

Urgent Pointer Contains the sequence number of the last octet in a sequence of urgent data. This allows the receiver to know how much urgent data is

Padding Specifies the maximum segment size that will be accepted

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2) What are the advantages of optical fibre Communication

A) ↳ Greater Capacity i.e datarates of 100's of Gbps

↳ Smaller Size in weight

↳ Lower Attenuation

↳ Greater repeater Spacing

↳ Electromagnetic Isolation

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3) Distinguish Slope overload Distortion & granular noise

A) Slope Overload Distortion and granular noise are the two major drawbacks of delta modulation.

Slope Overload distortion : It is caused due to large dynamic range of the input signal. Large error is created between the original input signal $x(t)$ and the staircase approximated signal.

Granular noise : It is occured when the step size is too large in comparison to small variations in the input signal. Error is introduced between the input signal and the approximated staircase signal

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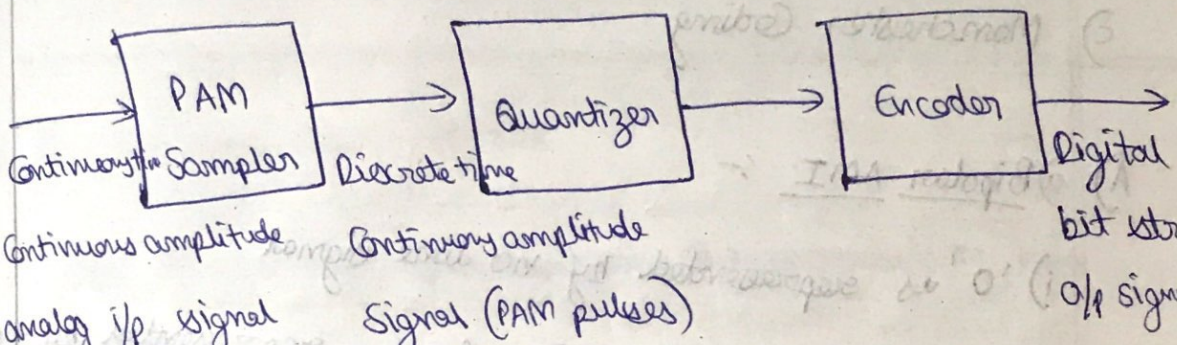
4) What are the steps involved in PCM explain?

A) PCM involves three steps :-

1) Sampling

2) Quantising

3) Encoding



The original analog signal is first sampled (at a rate of 2B where 'B' is the Band width of the original signal (or) once every Ts sec $\left(T_S = \frac{1}{2B}\right)$. These samples are called pulse amplitude modulation samples Each PAM Sampler is approximated by being quantised into 1 of 16 different levels. Each Sample can then be represented by 4 bits Thus, PCM starts with a Continuous time, Continuous

analog signal from which a digital signal is produced.

5) For the given message '110011' encode using

a) Bipolar AMI

b) Pseudoternary

c) Manchester Coding

A) a) Bipolar AMI :-

i) '0' is represented by no line signal

ii) '1' pulses alternate in polarity represented by +ve & -ve pulse

Given message — 110011

Encoded message — +-00+-

b) Pseudoternary :-

i) '1' is represented by absence of line signal

ii) '0' is represented by alternating +ve & -ve

Given message — 1100 11

Encoded message — 00+-00

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9) Manchester :-

i) has transition in middle of each bit period

ii) low to high represents logic-'1'

high to low represents logic-'0'

Given message — 1 1 0 0 1 1

Encoded message — -0-1--

6) a) Discuss OSI Model

A) OSI Model i.e Open Systems Interconnection has Seven layer :-

1) Application layer
2) Presentation layer
3) Session layer
4) Transport layer
5) network layer
6) Data link layer
7) Physical layer

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→ Application Layer :-

Provides access to the OSI environment for users & also provides distributed information services.

→ Presentation Layer :-

Provides independence to the application processes from differences in data representation

→ Session layer :-

Provides the control structure for communication between application ; establishes, manages and terminates sessions between cooperating application.

→ Transport layer :-

Provides reliable, transparent transfer of data between end points ; provides end to end error recovery & flow control.

→ Network layer :-

Provides upper layers with independence from the data transmission & switching technologies used to connect systems responsible for establishing, maintaining, terminati

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Connections.

→ Datalink layer :-

Provides the reliable transfer of information across the physical link; sends blocks (frames) with the necessary synchronisation, error control & flow control

→ Physical layer :-

Concerned with transmission of unstructured bitstream over physical medium; deals with the mechanical, electrical functional and procedural characteristics to access the physical medium.

Q) Explain the need for protocol architecture.

A) A need for protocol architecture

→ Data exchange can involve complex procedure

Ex:- file transfer

→ Better if task is broken into subtasks

→ implemented separately in layers in stack

1) each layer provides functions needed to perform

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Communication for layers above using function provided by layers below.

→ peer layers communicate within a protocol

→ The peer layers communicate using a set of rules or conventions known as protocol

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T) Explain Sliding window flow control technique.

A) The problem with stop & wait flow control technique is that only one frame at a time can be in transit. Efficiency can be greatly improved by allowing multiple frames to be in transit at the same time.

↳ Consider 2 stations, A and B, connected via full Duplex link. Station B allocates Buffer space for W frames. Thus B can accept W frames and A is allowed to send W frames without waiting for any acknowledgement. B acknowledges a frame by sending an acknowledgement that includes the sequence number of the next frame expected. This scheme

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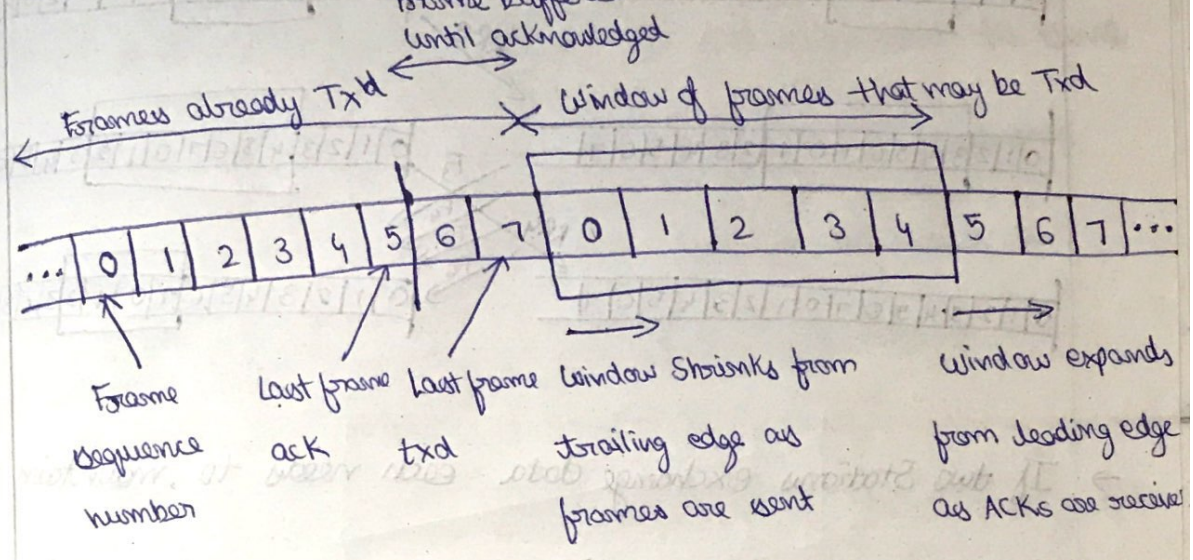
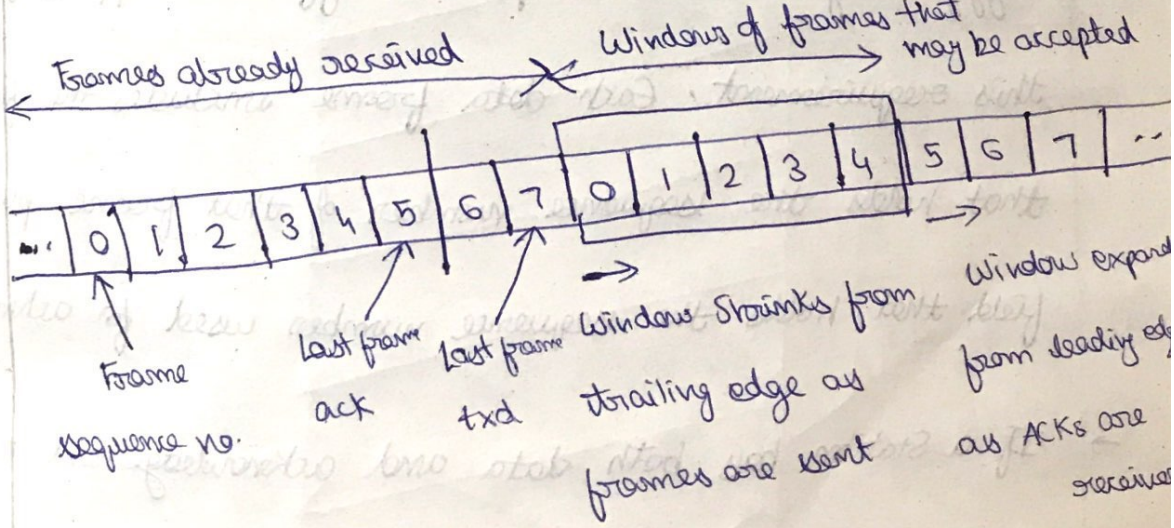
can also be used to act multiple frames and is known as Sliding window flow control.

(a) Sender's perspective



(b) Receiver's perspective



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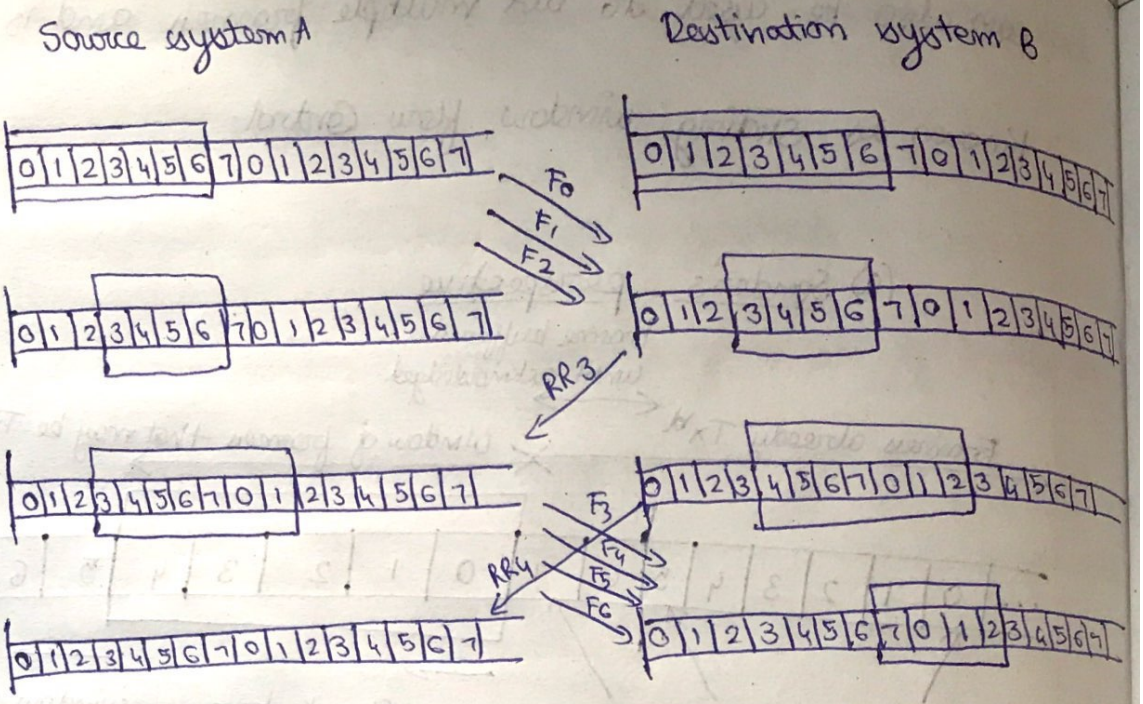

→ If two Stations exchange data each needs to maintain 2 windows One for transmit & other for receive and each side needs to send the data and acknowledgements to each other.

→ Piggybacking is used to provide efficient support for this requirement. Each data frame includes the field that holds the sequence number of that frame. plus a field that holds the sequence number used for acknowledg

→ If a Station has both data and acknowledgement to send, it sends both together in one frame saving Communication Capacity.

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→ If a station has acknowledgement but no data to send then it sends a separate acknowledgement frame such as RR & RNR.

→ If a station has data but no acknowledgement to send it must repeat the last acknowledgement sequence number that it sent. When a station receives a duplicate acknowledgement, it simply ignores it.

8) Explain Go-back-N ARQ mechanism discussing all the cases.

A) The form of error control based on sliding-window flow control that is most commonly used is called go-back-N ARQ. In this method, both sender and receiver maintain a window.

→ The sending-window size enables the sender to send multiple frames without receiving the acknowledgement of the previous ones.

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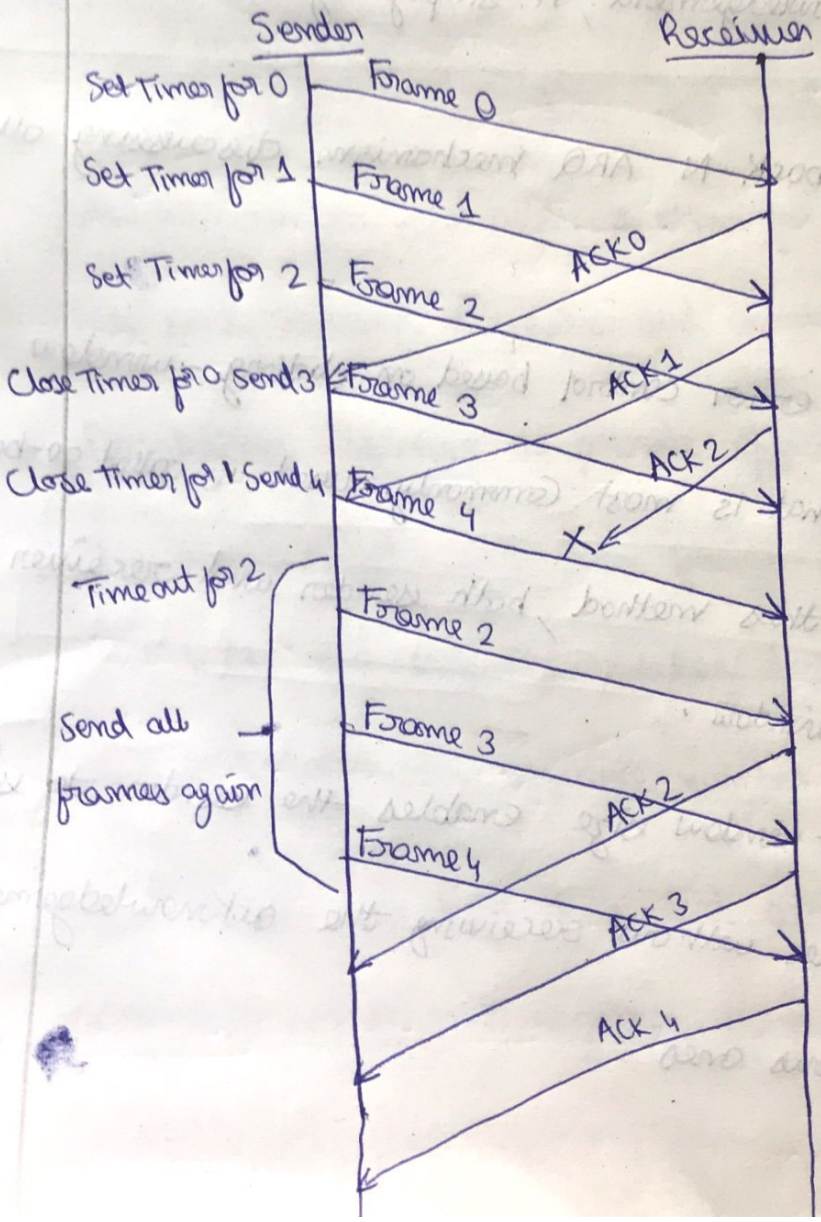
→ The receiving window enables the receiver to receive multiple frames and acknowledge them. The receiver keeps track of incoming frame's sequence number.

→ When the sender sends all the frames in window, it checks up to what sequence number it has received positive acknowledgement.



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→ If all the frames are positively acknowledged, the sender sends next set of frames.

→ If sender finds that it has received Negative acknowledge or has not receive any Acknowledgement for a particular frame, it retransmits all the frames after which it does not receive any positive ACK.

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9) Differentiate Synchronous & Asynchronous transmission

A)

Synchronous transmission	Asynchronous transmission
1) Sends data in the form of blocks or frames	1) Sends one byte or character at a time
2) Transmission Speed is fast	2) Transmission Speed is slow
3) Expensive	3) Economical
4) Time interval is Constant	4) Time interval is Random
5) Gap b/w the data is absent	5) Gap between the data is present

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6) Ex:- Chat Rooms, Video Conferencing, Telephone Conversations	Ex:- Letters, emails, forums, etc.
7) These are synchronized by an external clock	7) These are synchronized by special signals along the transmission medium
8) The basic sender & receiver use the same clock signal	8) No Common clock signal is present between the sender and receiver
9) It uses Start and Stop bits to Control the transmission of information	9) Each block begins with preamble bit pattern & ends with postamble bit pattern

10a) What are the three modes of HDLC.

A) The three data transfer modes are

1) Normal response mode (NRM) : Used with an unbalanced Configuration. The primary may initiate data

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transfer to a Secondary, but a secondary may only transmit data in response to a command from primary

2) Asynchronous balance mode (ABM) : Used with a balanced configuration. Either Combined station may initiate transmission without receiving permission from the other Combined station.

3) Asynchronous response mode (ARM) : Used with an unbalanced configuration. The Secondary may initiate transmission without explicit permission of the primary. The primary still retains responsibility for the line, including initialization, error recovery, and logical disconnection.

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b) What is meant by bit stuffing explain with the help of an example.

A) HDLC uses synchronous transmission. All transmissions are in the form of frames and a single frame format suffices for all types of data and control exchanges

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A single flag may be used as the closing flag for one frame and the opening flag for next. On both sides of the user network interface, receivers are continuously hunting for the flag sequence to synchronize on the start of a frame. While receiving a frame, a station continues to hunt for that sequence to determine the end of the frame. Because the protocol allows the presence of arbitrary bit patterns there is no assurance that the pattern will not appear somewhere inside the frame, thus destroying synchronization. To avoid this problem bit stuffing is used. For all bits between the starting and ending flags, the transmitter inserts an extra 0 bit after each occurrence of five 1s in the frame. After detecting a starting flag, the receiver monitors the bit stream. When a pattern of five 1s appears, the sixth bit is examined, If this bit is 0, it is deleted. If the sixth bit is a 1

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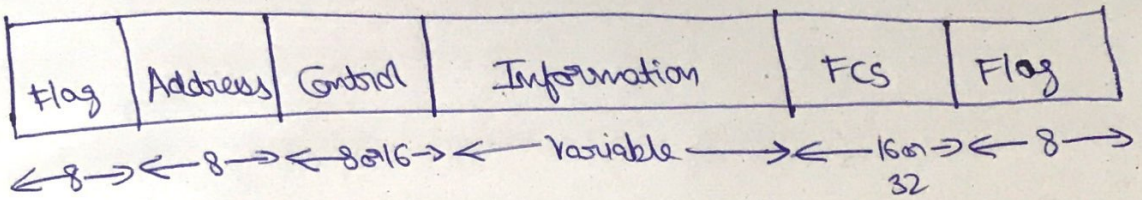
and the seventh bit is 0, the combination is accepted as a flag.

With the use of bit-stuffing, arbitrary bit patterns can be inserted into the data field of the frame. This property is known as data transparency.



(a) Frame format

Bit stuffing example :-

Original pattern: 1111111111110111110111111110

After bit stuffing:

11111011111010111110101111101010

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