PART A

1)a) Define computer Network? [1M]

A computer Network is any System that connects two or more computers or devices to share data resources, and services.

b) List out guided and unguided transmission media.? [1M]

Guided Media : Twissted Pair cable, coaxial cable, fiber optical cable.

unguided Media : Radio waves, Micro waves, Infrared waves.

c) What are the design issues of data link layer? [1M]

Design issues of Data link layer

1) Providing Services to the network layer
2) formation of frames
3) Error control
4) keep track on the flow of frames

d) Define PPP ? [1M]

Point-to-Point Protocol is a data link layer protocol that establishes a direct connection between two nodes, such as two routers, over a point-to-point link.

e) Define network routing ? [1M]

The process of choosing a path across one or more networks is known as Network Routing.

f. What is the network address in a class A subnet with the IP address of one of the hosts as 25.34.12.56 and mask 255.255.0.0? [1M]

For the IP 25.34.12.56 with mask 255.255.0.0 the network address 25.34.0.0

g) What are the responsibilities of transport layer ? [1M]

The Responsibilites of the transport layer

* segmentation and reassembly of data
* flow control
* error control
* multiplexing / demultiplexing

h) Define jitter ? [1M]

Ans Jitter is the variation in the delay of data packets as they travel across a network, causing them to arrive at inconsistent intervals.

i) List the functions of application layer ? [1M]

The application layer's main functions are to provide an interface for applications to access network services, handle data representation and formatting for user-friendly communication.

j) Define static and dynamic web pages? [1M]

Static web page :- These pages are pre-built and stored on a web server as fixed files.

Dynamic web :- In dynamic webpages, the content of pages is different for different visitors.

PART-B

2) Explain different layers and their functionality of TCP/IP reference model with neat sketch. [10M]

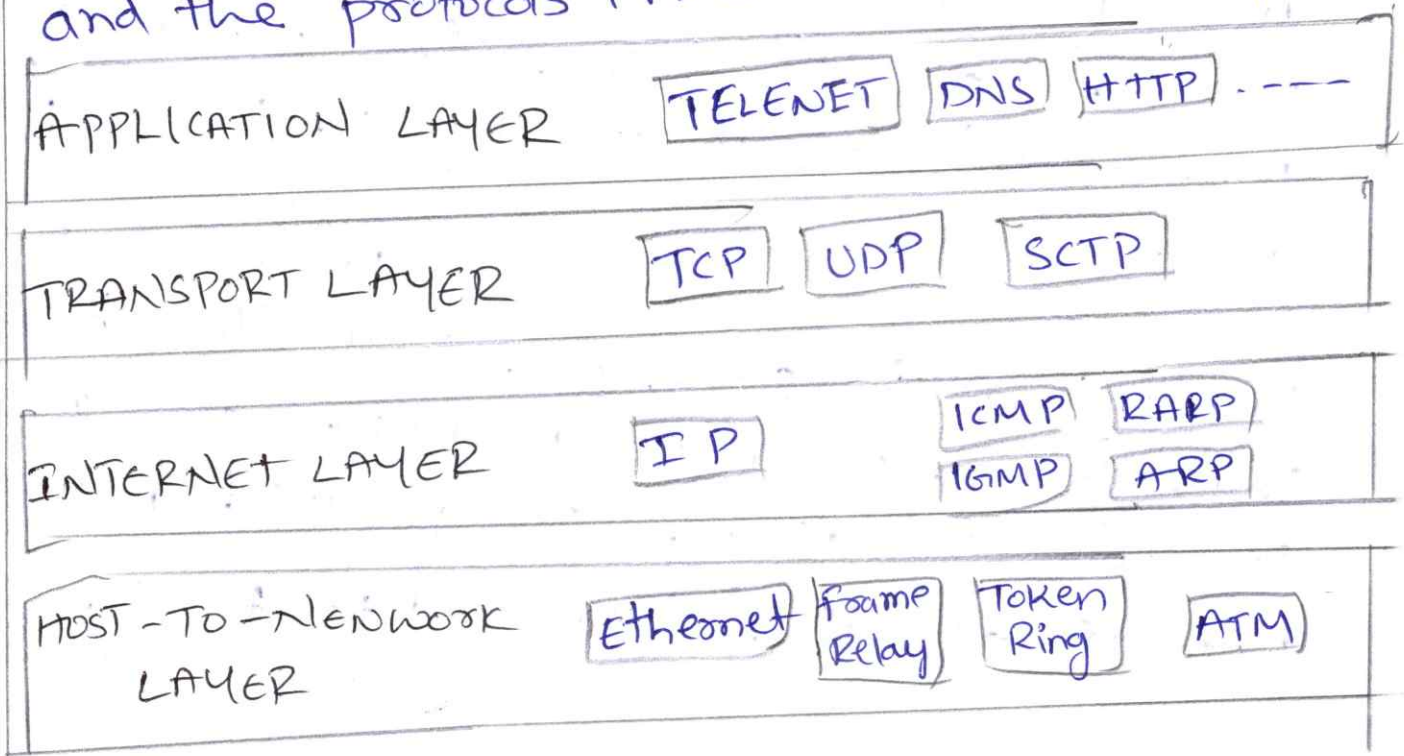
TCP/IP :- Reference Model is a four-layered suite of communication protocol. It was developed by the DOD (Department of Defence) in the 1960s. It is named after the two main protocols that are used in the model, namely, TCP and IP. TCP stands for "Transmission control protocol" and IP stands for Internet protocol" The four layers in the TCP/IP protocol suite are

1) Host-to-Network Layer :- It is the lowest layer that is concerned with the physical transmission of data. TCP/IP does not specifically define any protocol here but supports all the standard protocols.

iii) Internet layer :- It define the protocol for logical transmission of data over the network The main protocol in thij layer is internet protocol (IP) and it is supported by the protocol ICMP, IGMP, RARP, and ARP.

iiij Transport layer :- It is Resporasbile for eooror free and and to-end delivary of data The protocol debined here are trasmission control protocol (TCP) and user datagram protocol (UDP).

iv) Application Layer :- Thij is the topmost layer and debines the Interface of host programs with the trasport layer services Thij layer includes all high level protocol leke Telnet, DNS, HTTP, FTP, SMTP, etc, The following diagram shows the layeos and the protocols in each of the layeos.



3) What are the different types of networks? Explain in details. [10M]

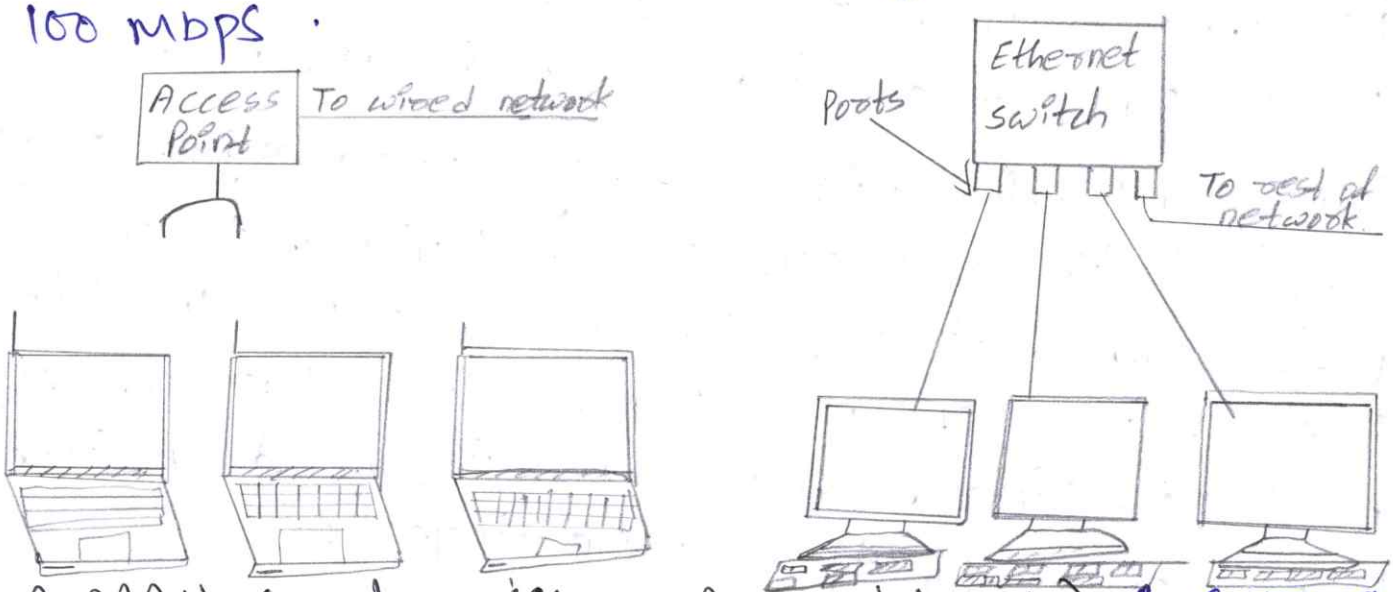
* Personal area network
* Local Area Network
* metropolitan area network
* wide area networks.

PAN (Personal Area Network) :-

Let devices devices communicate over the range of a person. A common example is a wireless network that connect a computer with its peripherals. Some companies with got together to design a short-range wireless network called Bluetooth to connect these connect these components wires The idea is that if your devices have Bluetooth, then you need no cables. You just put them down, turn them on, and they work together

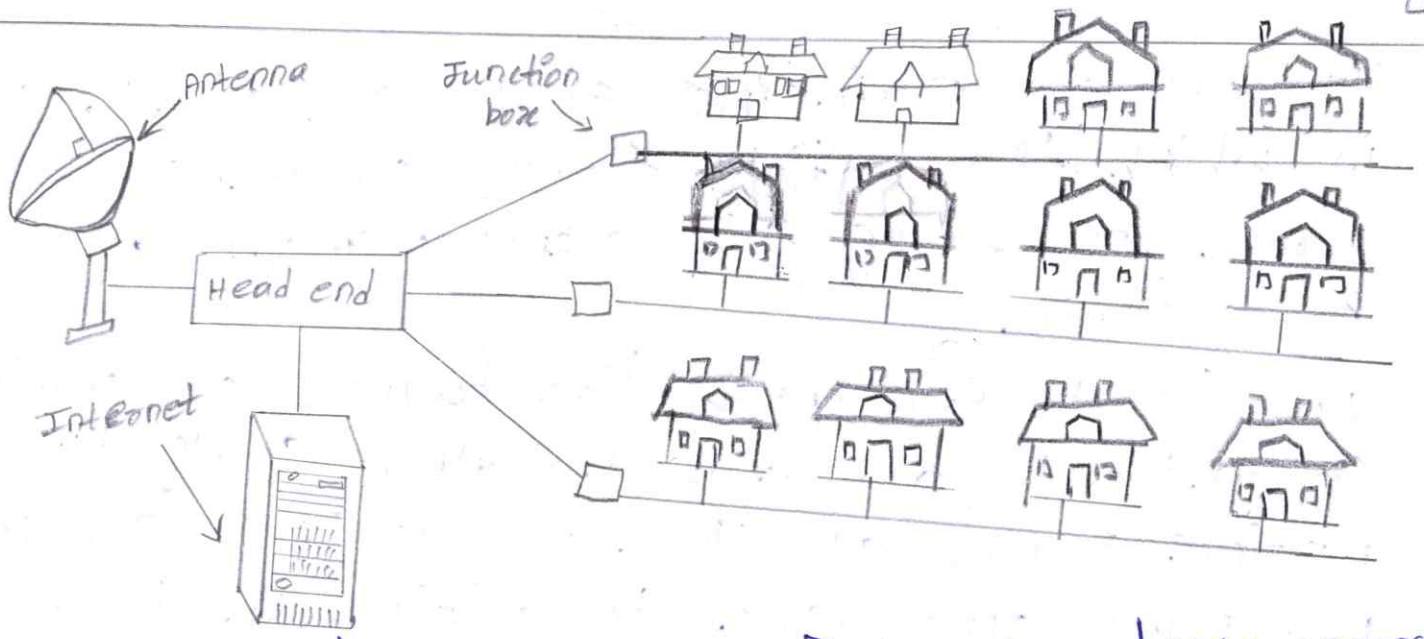
A LAN is a privately owned network that operates within and nearby a single building like a home, office or factory

When LANs are used by companies, they are called enterprise network. wireless LANs are very popular these days, especially in homes older office buildings, cafeterias, and other places where it is too much trouble to install cables. There is a standard for wireless LAN called IEEE 802.11, popularly known as wifi. It runs at speeds anywhere from 11 to 100 Mbps.



A MAN (metropolitan Area Network) : Cover a city. The best-known examples of MANs are the cable television networks available in many cities.

These systems grew from earlier community antenna systems used in areas with poor over-the-air television reception.



A WAN (wide area network) spans a large geographical area, often a country or continent. Each of these offices containg computers intended for running user (i.e. application) programs. The job of the subnet is to carry messages from host to host, subnet consists of two distinct components: transmission lines move bits between machine. They can be made of coper wire, optical fibes, or even radio links. These switching computers have been called by various names in the past; The name router is now most commonly used.

4. Explain Go-Back-N ARQ Protocol using selective repeat with neat sketch [10M]

In Go-Back-N ARQ, N is the Sender's window size, suppose we say that Go-Back-3, which means that the three frames can be sent at a time before expecting the acknowledgment frome the receiver.

It uses the principle of protocol pipelining in which the multiple frames can be sent before receiving the acknowledgment of the first frame.

In Go-Back-N ARQ, the frames are numbered sequentially as Go-Back N ARQ sends the multiple frames at a time that requires the numbering approaches to distinguish the frame from another frame.

The sequence number of the outbound frames depends upon the size of the sender's window then the sequence number will not be 1,2,3,4,5,6,7,8,9,10 Let's understand through an example.

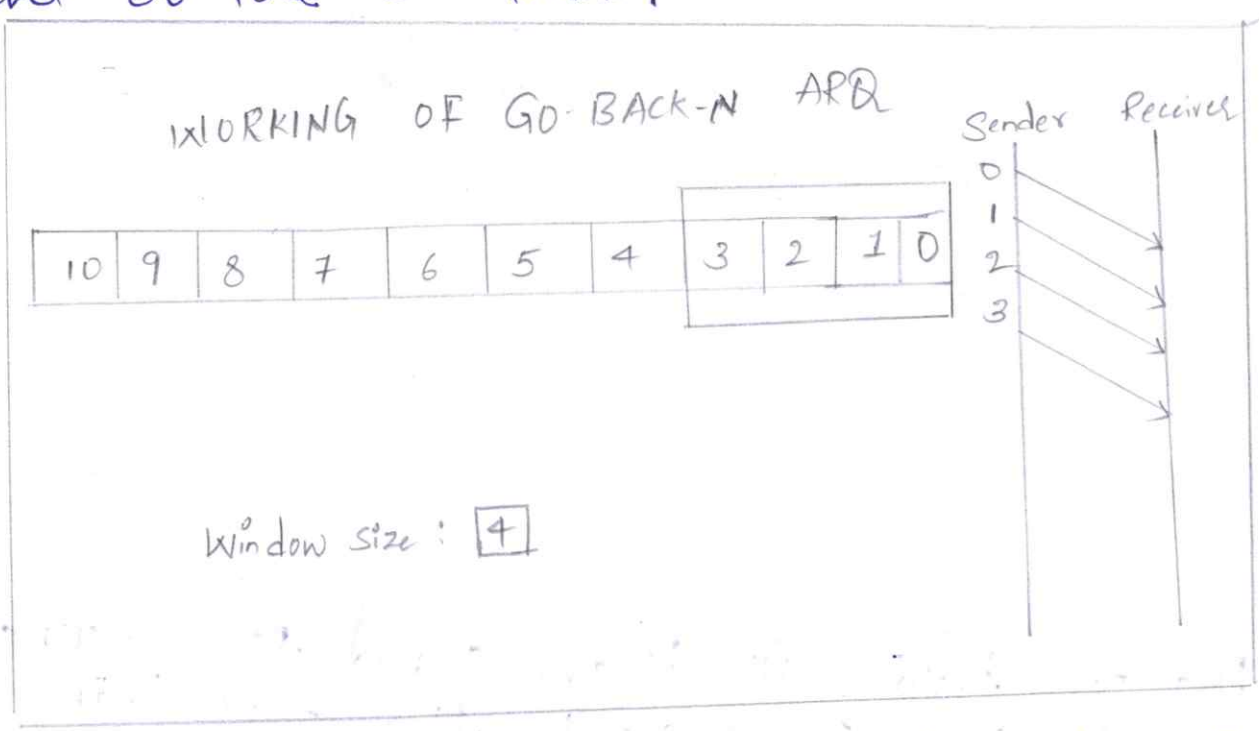
* N is the sender's window size.
* If the size of the sender's window is 4 then the sequence number will be 0,1,2,3,0,1,2,3,0,1,2 and so on.

Ex.

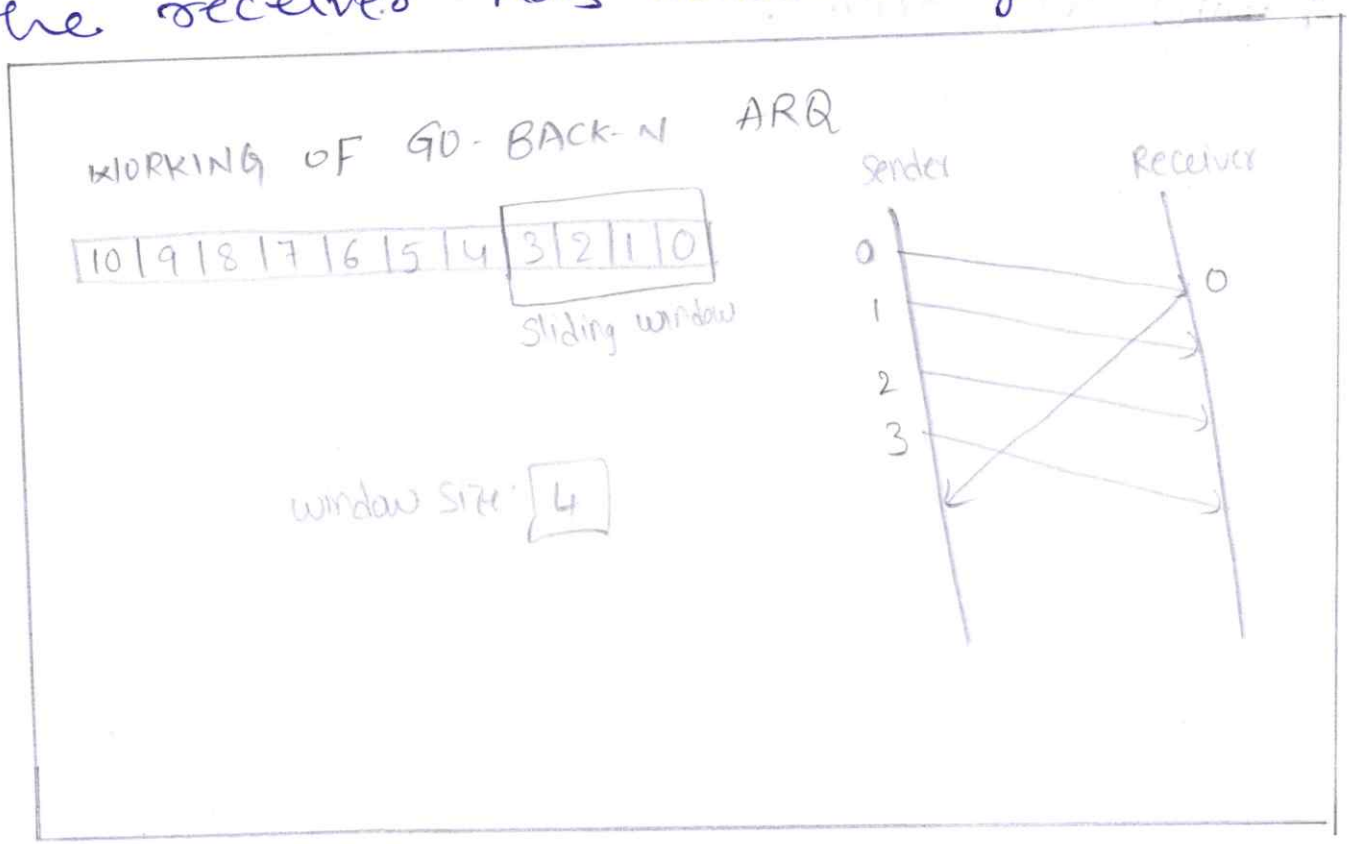
Suppose there are a sender and a receiver and let's assume that there are 11 frames to be sent. These frames are required as 0,1,2,3,4,5,6,7,8,9,10, and these are the sequence numbers of the frames.

Lets consider the window size 4, which means that the four frames can be sent at a time before expecting the first frame.

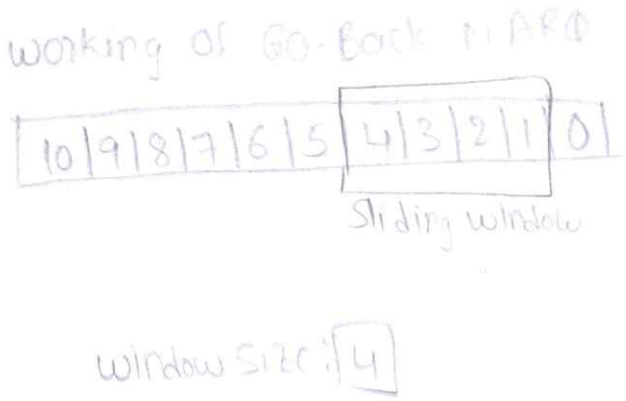
Step 1 :- Firstly, the sender will send the first four frames to the receiver, i.e. 0, 1, 2, 3 and now the sender is expected to receives the acknowledgment of the 0th frame.

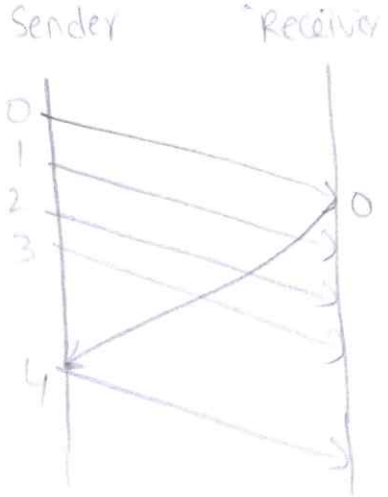


Let's assume that the receiver has send the acknowledgment for the 0 frame, and the receiver has succesfully received it.

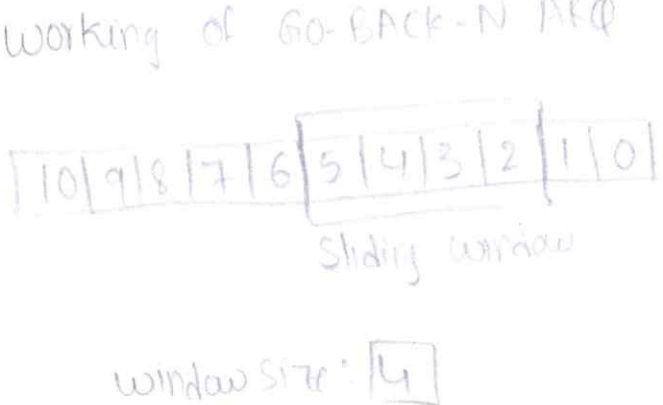


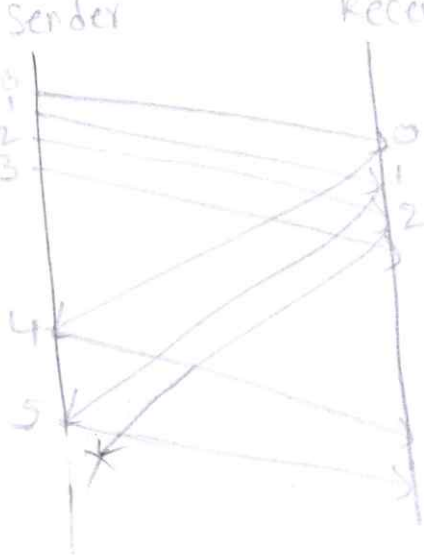
The sender will then send the next frames, i.
and the window slides containing four frames
(1, 2, 3, 4)





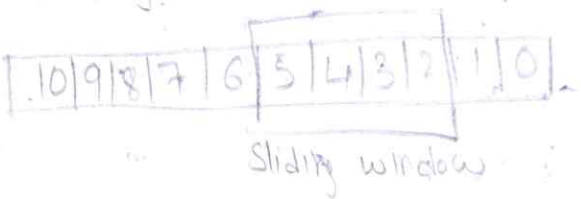
The receiver will then send the acknowledgm-
ent for the frames no 1. After receiving the
acknowledgment, the sender will send the
next frame, 5, and the window will slide
having four frames (2, 3, 4, 5).



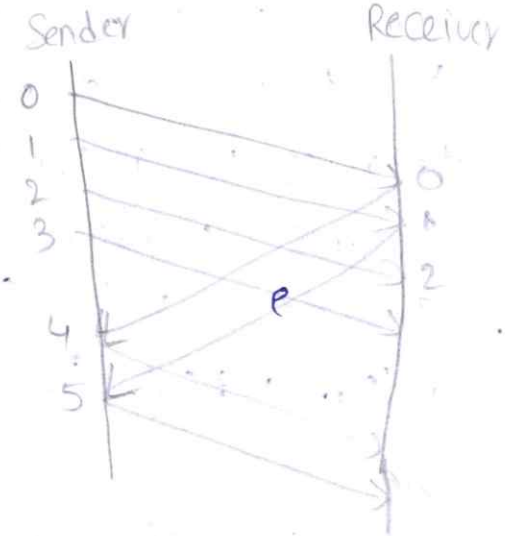


Now let's assume that the receiver is not acknowledging the frame no2, either the frame is lost, or the acknowledgment is lost retransmits all the frames in the current window, i.e 2,3,4,5,

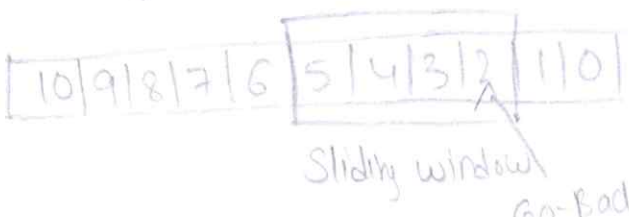
Working of GO-BACK-N ARQ



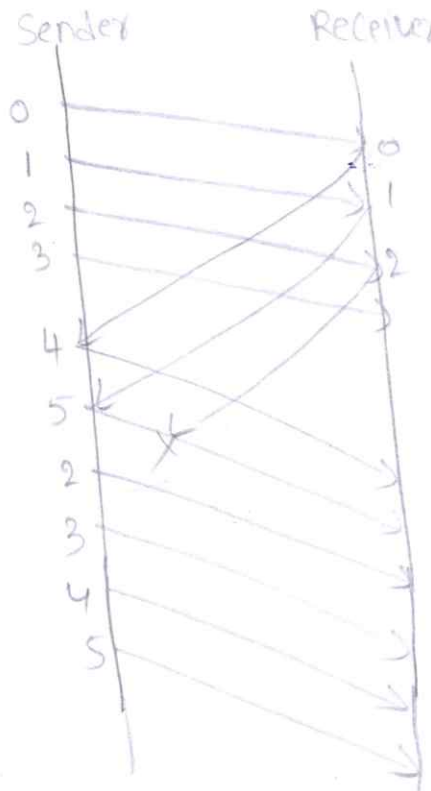
Window size: 4



Working of GO-BACK-N ARQ



Window size: 4



ev

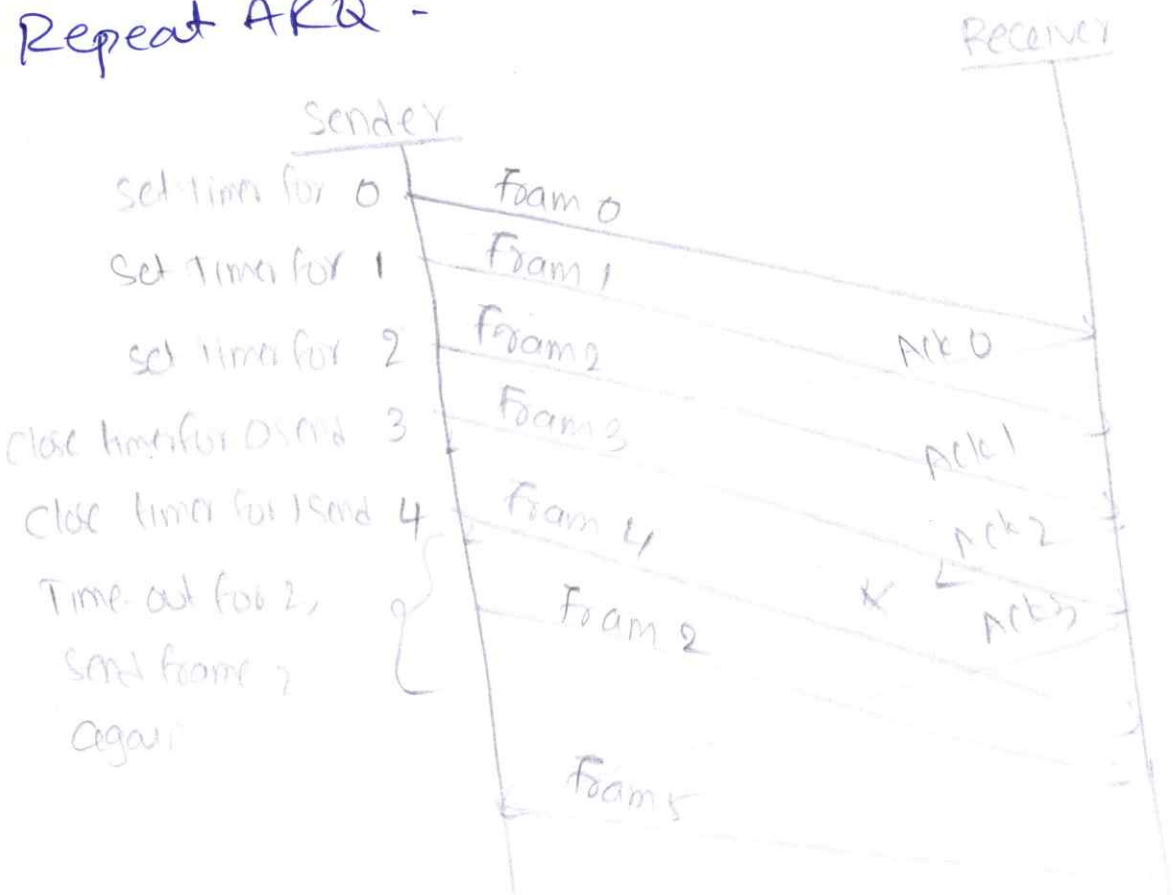
Selective Repeat ARQ.

It is also knows as sliding window Protocol and used for error detection and control in the data link layer.

In Selective Repeat ARQ only the lost or corror frames are retransmitted, whereas correct frames are received and buffered. The frames in memory and sends NACK for only frames which are missing or damaged The sender will send / retransmit a packet for which NACK is received.

Example :-

Given below is an example of the selective Repeat ARQ -



step 1 frame 0 sends from Sender to receiver and sent timer.

step2: without waiting for Acknowledgement from the receiver another frame, Frame 1 is sent by sender by sender by setting the timer for it.

step3: In the same way frame2 is also sent to receiver by setting the frame and the timer without waiting for previous acknowledgment.

step4: Whenever Sender receives the ACK0 from receiver, within the frame 0. timer then it is closed and sent to the next frame, frame 3.

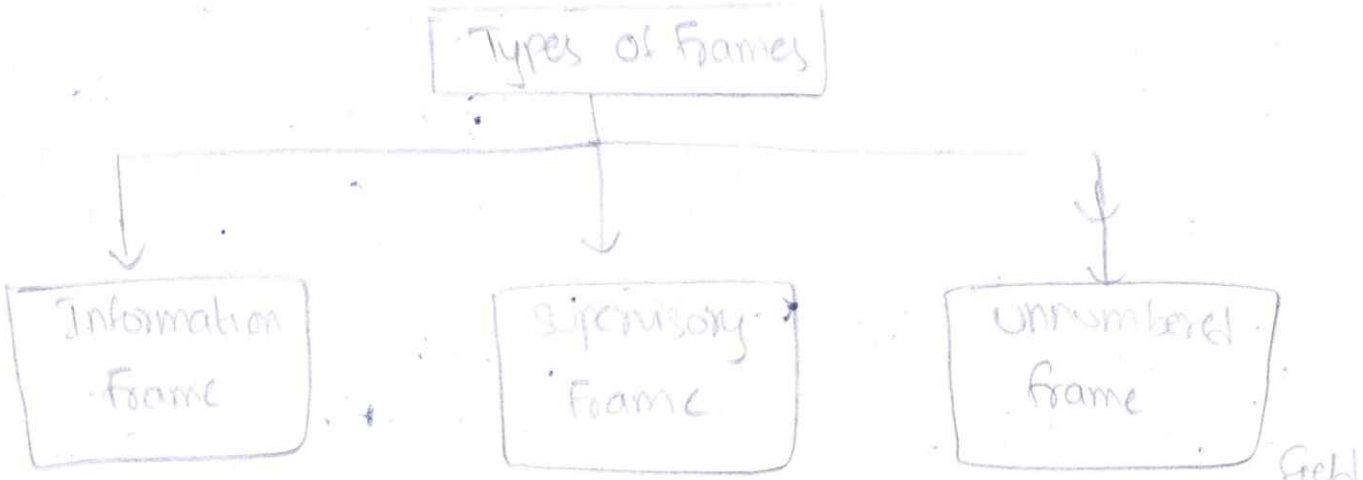
step5: whenever Sender receive the ACK1 from the receiver. the frame 1 timer then it is closed and sent to the next frame, frame4,

step 6: If the Sender doesnt receive the ACK2 from the receiver within the time slot, it declares timeout for frames 2 and resends the frame2 may be lost or damaged.

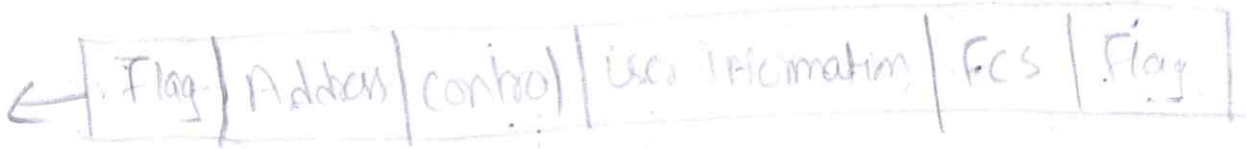
5a) What is HDLC? Explain the frame format in HDLC with types [5M]

High-Level Data link control (HDLC) generally provides flexibility, HDLC basically uses and explains three different types of frames. Type of frame is basically determined by control field frame. Each type of frame generally serves as an envelope for transmission

of various types of messages. These three different classes of frames used in HDLC are given below.

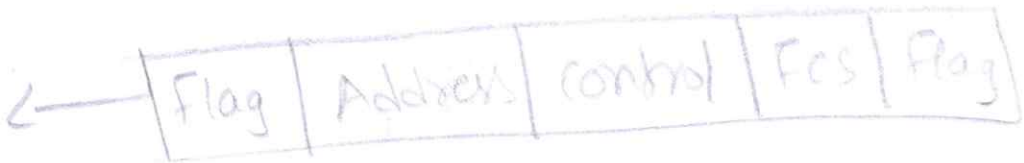


1) I-Frame : I-frame stands for information frames This frame is generally used for transporting user data from network layer. It can also be used to piggy back Acknowledgment information in case of ABM (ASynchronous Balanced Mode). The first bit of this frame of control field is 0.



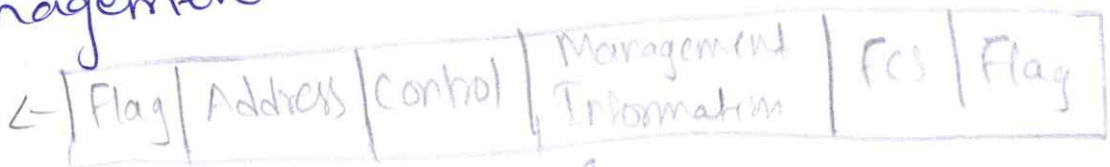
I-Frame

2. S-frame :- S-frame stands for Supervisory frames These frames are basically required and essential for error control and flow control. They also provide control information. First two bits of this frames of control field is 10. S-frame does not have any information fields. This frame contains send and receives sequence numbers.



S-frame

3. U-frame ; U-frame stands for unnumbered frames. These frames are also required in various functions like link setup and disconnections. These frames basically support control purpose and are not sequenced. First two-bit of this frame of control field is 11 some U-frame contains an information
U-frames is required for managing link itself These frames are generally reserved for system management.



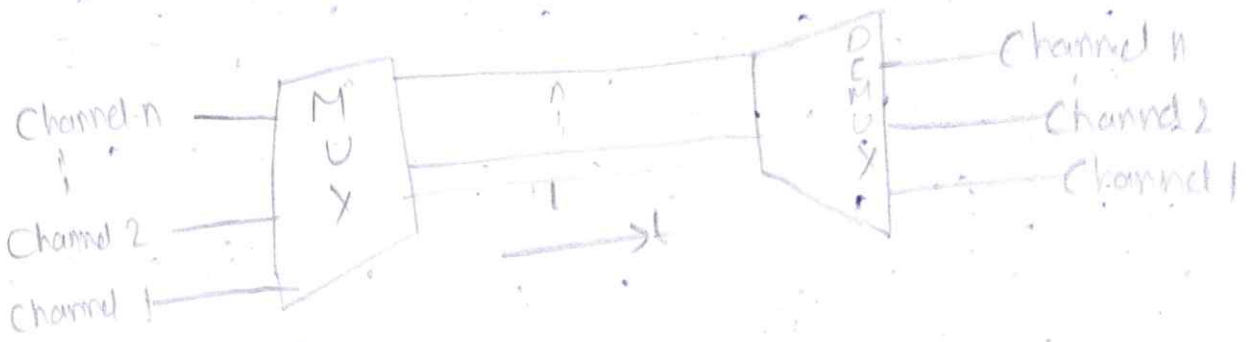
U-frame

b) Explain the frequency division multiplexing with sketch. ? [5M]

Frequency Division Multiplexing (FDM):

In this a number of signals are transmitted at the same time, and each source transfers its signals in this alloted frequence range. There is a suitable frequency gap between the 2 adjecent signals to avoid over-lapping.

The frequency spectrum is divided into several logical channels, in which every user feels that they processes a particular bandwidth. A number of signals are sent simultaneously at the same time allocating separate frequence bands or channels to each signal. There fore to avoid interface between two successive channels Gaurd bands are used.



Application of FDM :

1. In the first generation of mobile phones, FDM was used.
2. The use of FDM in television broadcasting
3. FDM is used to broadcast FM and AM radio frequencies.

6. Illustrate the routing functionality of Distance Vectors routing algorithm with an example ? [10M]

In distance vector routing (DVR) each router is required to inform the topology changes to its neighboring routers periodically. Historically it is known as the old ARPNET routing algorithm or Bellman - Ford algorithm.

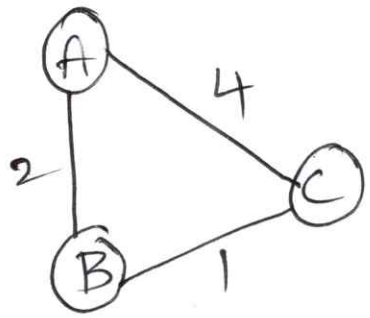
How the DVR Protocol Works :

* In DVR, each router maintains a routing table. It contains only one entry for each router. It contains two parts - a preferred outgoing line to use for that destination and an estimate of time (delay) Tables are updated by exchanging the information with the neighbor's nodes.
* Each router knows the delay in reaching its neighbors (Eg- send echo request)
* If the path via the neighbour has a lower cost, then the router updates its local table to forward packets to the neighbor.

Ex:- Distance vector Routes Protocol

In the network shown below, there are three routers, A, B, C, with the following weights— AB=2, BC=3, and CA=5.

Step 1- In this DVR network each router shares its routing table with every neighbor. For example, A will share its routing table with neighbors B and C and neighbors B and C will share their routing table with A.



From A	A	B	C
A	0	2	3
B			
C			

From B	A	B	C
A			
B	2	0	1
C			

From C	A	B	C
A			
B			
C	3	1	0

Step 2 :- If the path via neighbor has a lower cost, then the router updates its local table to forward packets to the neighbor. In the table, the router updates the lower cost for A and C by updating the new weight from 4 to 3 in router A and from 4 to 3 in router C.

From A	A	B	C
A	0	2	3
B			
C			

From B	A	B	C
A			
B	2	0	1
C			

From C	A	B	C
A			

B			
C	3	1	0

Step 3 – The final updated routing table with lower cost distance vector routing protocol for all routers A, B, and C is given below –

Router A

FromA	A	B	C
A	0	2	3
B	2	0	1
C	3	1	0

Router B

From B	A	B	C
A	0	2	3
B	2	0	1
C	3	1	0

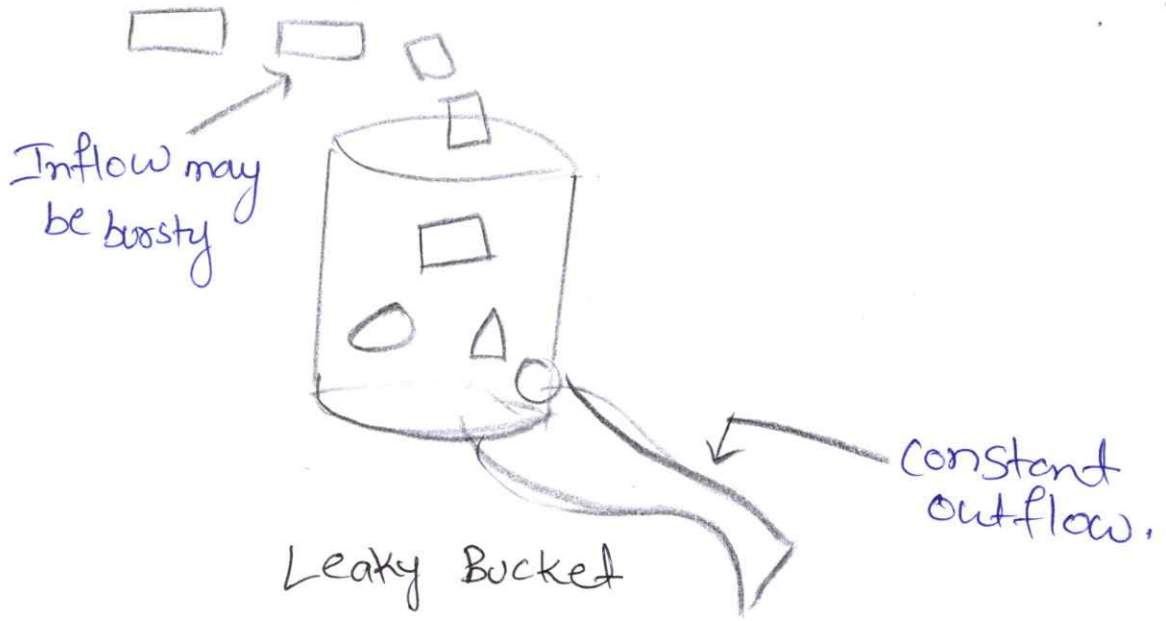
Router C

From C	A	B	C
A	0	2	3
B	2	0	1
C	3	1	0

7. Explain the congestion control algorithm. ? [10M]

Congestion control Algorithm :-

1) Leaky Bucket Algorithm :- The leaky bucket algorithm controls the flow of packet by sending them out at a constant, fixed rate, regardless of incoming burst traffic. Packet are placed into a bucket (queue), and if the bucket overflows excess packets are discarded. This ensures smooth traffic.



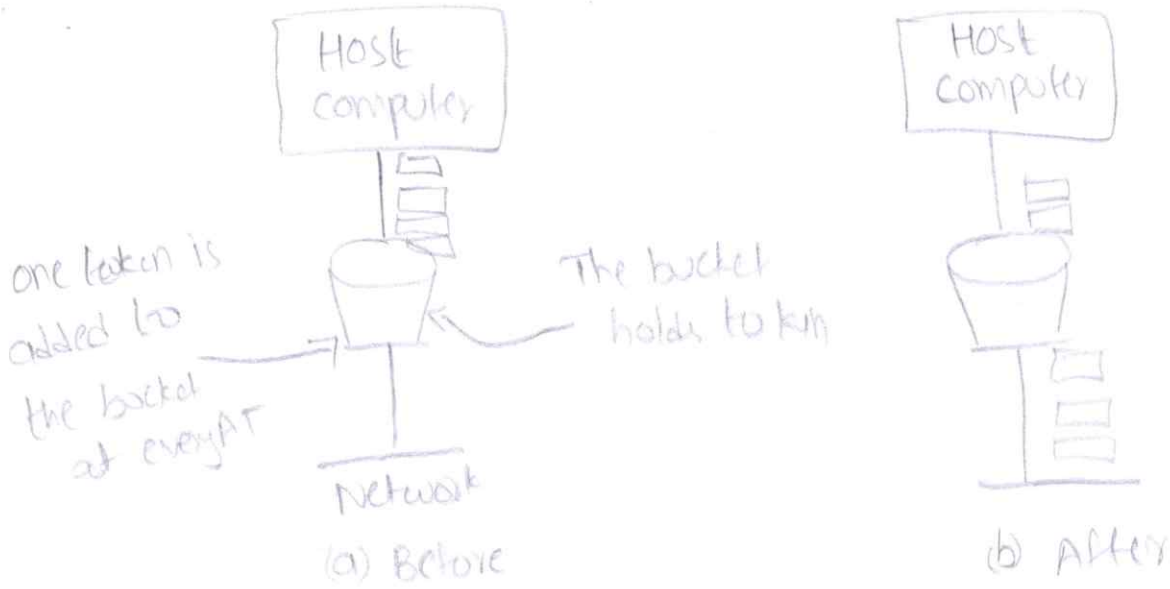
Steps:

* Packet arrive -> placed into the bucket.
* Bucket leaks (transmits) at a constant rate.
* Bursty traffic is smoothed into uniform traffic

Limitation: Too rigid, wastes available band width if traffic is bursty.

2. Token Bucket Algorithm:

The token bucket algorithm allows more flexibility by generating tokens at a fixed rate. A packet can only be transmitted if a token is available, and each packet consumes one token. If enough tokens accumulate, burst traffic can be sent quickly, making it better for handling variable traffic patterns without unnecessary drops.



Token Bucket

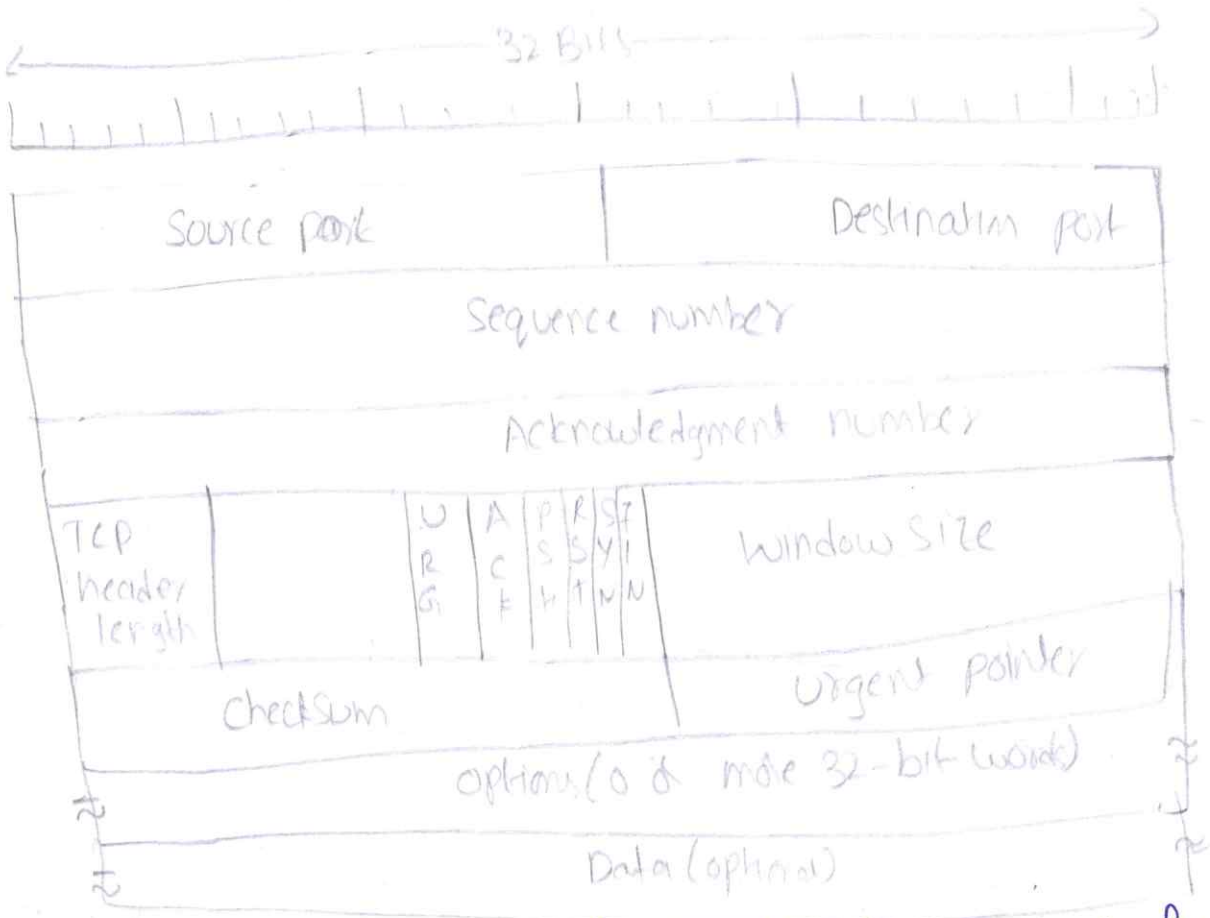
Steps:

* Tokens are added to the bucket at regular intervals.
* Each token permits sending one packet
* If token exist -> packets can be transmitted immediately.
* if no tokens -> packets must wait.

8. Draw and explain each field in the TCP Segment header.? [10 M]

* every segment begins with a fixed-format, 20byte header. The fixed header may be followed by header options. After the options, if any up to $65,535 - 20 - 20 = 65,495$ data bytes may follow, where the first 20 refer to the first 20 refers to the IP header and the second to the TCP header. Segments without any data are legal and are commonly used for acknowledgements and control messages.

figure 6-29. The TCP header



* The source port and destination port fields identify the local end points of the connection. The sequence number and Acknowledgment number fields perform their usual function. The TCP 32 bits long because every byte of data is numbered in the TCP header. This fields really indicates the start of the data within the segment, measured in 32-bit words. Next comes a 6-bit field that is not used.
* Now come six 1-bit flags. URG is set to 1 if the urgent pointer is in use.

* The PSH bit indicates Pushed data. The receiver is hereby kindly requested to deliver the data to the application upon arrival and not buffer it until a full buffer has been received.

* The RST bit is used to reset a connection that has become confused due to a host crash or some other reason.

* The SYN bit is used to establish connection. The connection request has SYN=1 and ACK=0 to the connection reply does bear an acknowledgment so it has SYN=1 and ACK=1.

* The FIN bit is used to release a connection. It specifies that the sender has no more data to transmit

* The Window size field tells how many byts may be sent starting at the byte acknowledged A window size field.

* A checksum is also provided for extra reliability. It checksum the header, the data and the conceptual pseudoheader shown. when performing this compatatation, the TCP checksum field is set to zero. and the data.

* The checksum algorithm is simply to add up all the 16-bit words in one's complement. and then to take the one's complement of the sum.

* The options field provides a way to add extra facilities not covered by the regular header. The most important option is the one that allows each host to specify the maximum TCP payloaded it is willing to accept.

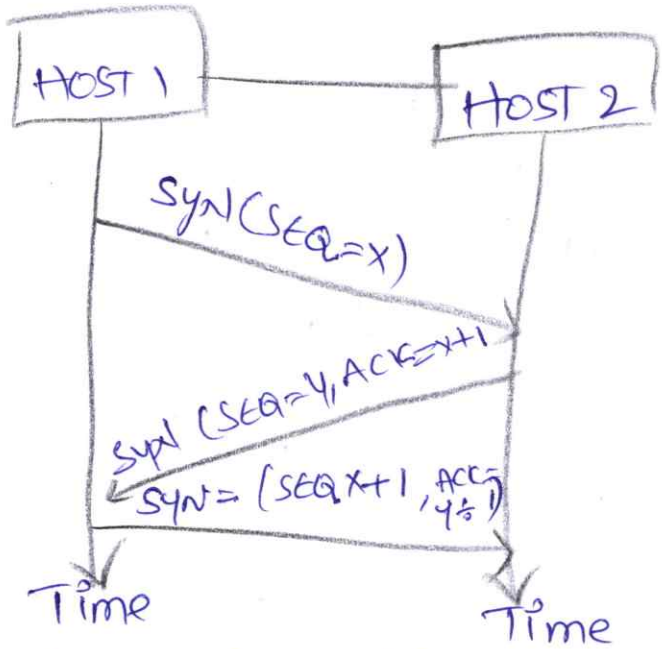
9) Explain TCP connection management with neat diagram. [10 M]

The connection is established in TCP using the three-way handshake as discussed earlier to create a connection. one side, say the server, passively stays for an incoming link by implementing the LISTEN and ACCEPT primitives either, either determining a particular other side or nobody in particular.

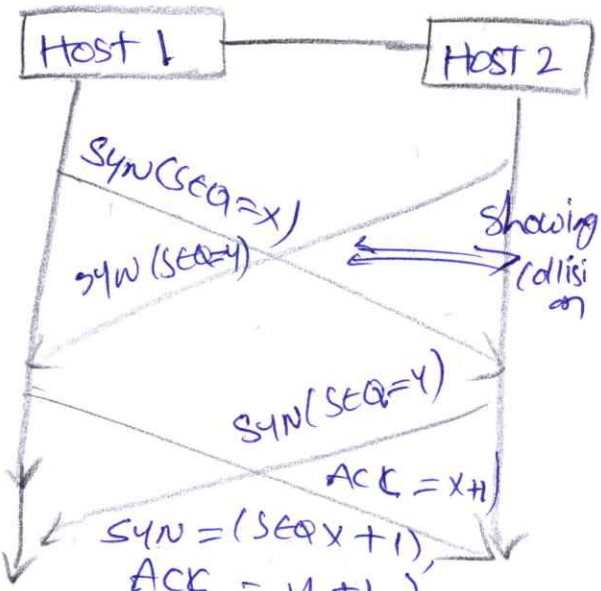
The other side performs a connect primitive specifying the I/O port to which it wants to join.

The CONNECT primitive transmits a TCP segment with the SYN bit on and the ACK bit off and waits for a response.

The sequence of TCP segment sent in the typical case, as shown in the figure below



(a) Normal operation



(b) Call collision

TCP connection Management.

When the segment by Host-1 reaches the destination, i.e; the receiving server checks to see if there is a process that has done a LISTEN on the port given in the destination port field.

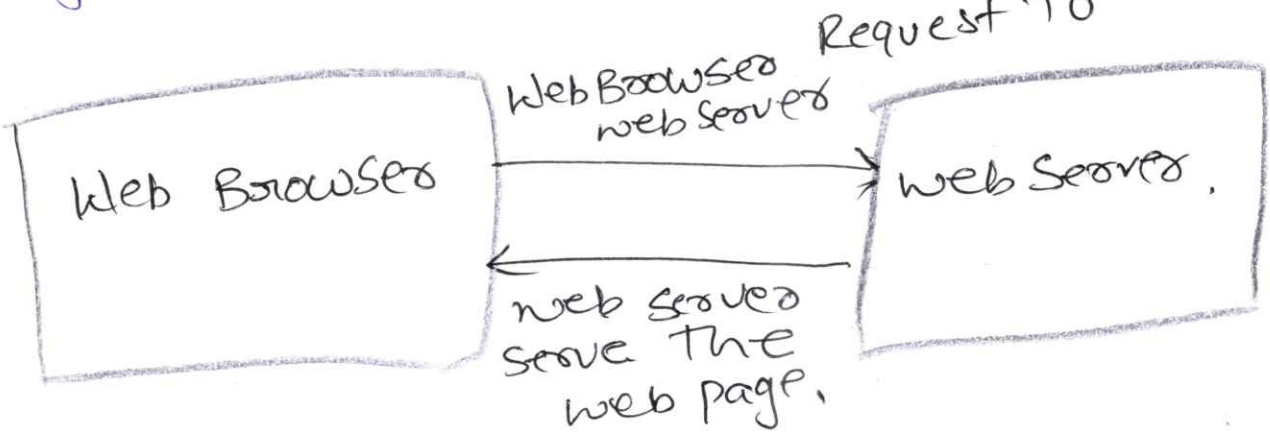
10) Explain the following terms. [10M]

i) WWW

*The Worldwide web (www), often called the web, is a system of interconnected webpages and information that you can access using the internet.

* The web allows us to browse website watch video, shop online, and connect with others around the world.

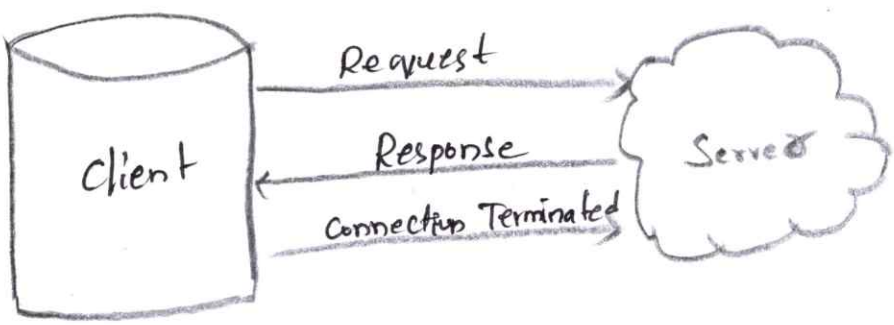
* All public website or web pages that people may access on their local computer and other devices.
* Users can get further information by navigating to the links interconnecting these pages. and document.



ii) HTTP

HTTP (Hypertext transfer protocol) is a fundamental protocol of the internet. enabling the transfer of the data between a client and a server
=> HTTP provides a standard between a web browsers and a web server to establish communication.

HTTP Connection

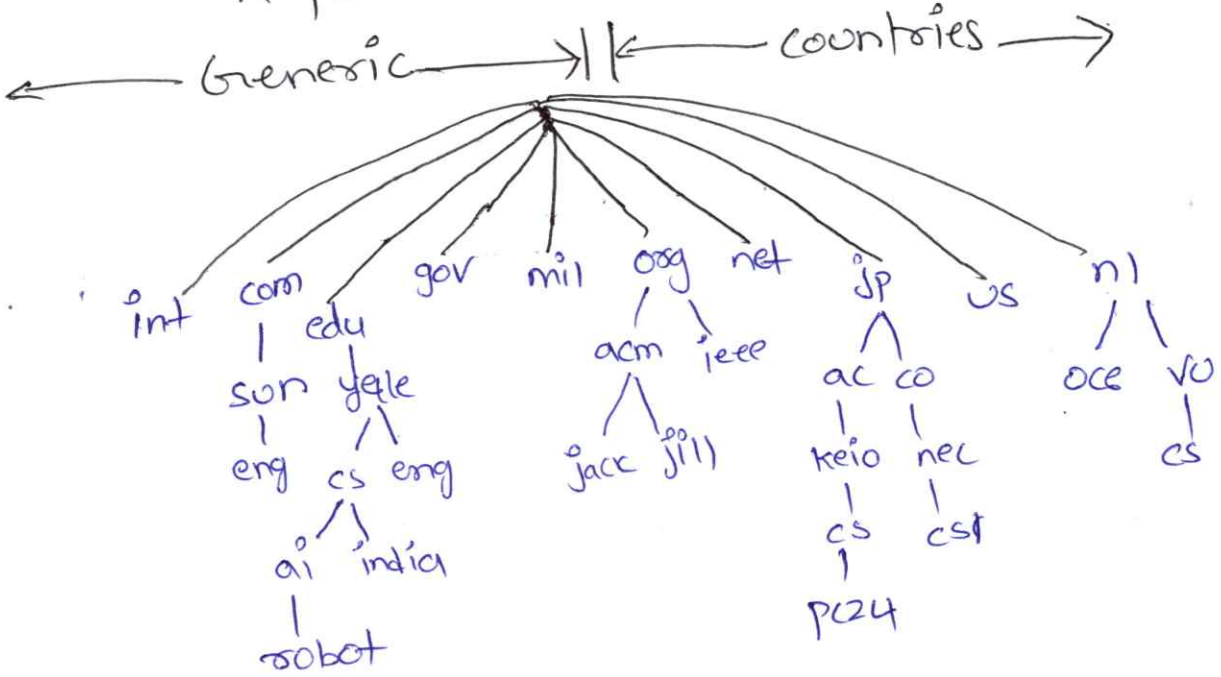


11a) How DNS service maps domain names to IP address? Explain with an example. [8M]

* The essence of DNS is the invention of a hierarchical, domain-based naming scheme and a distributed database system for implementing this naming scheme. it is primarily used for mapping host names and e-mail destinations to IP addresses but can also be used for other purpose.

* DNS is used is as follows. To map a name onto an IP address, an application program calls a library procedure called the resolver, passing it the names as a parameter. we saw an example of a resolver gethostbyname. The resolver sends a UDP packet to a local DNS server, which then looks up the name and return. the program can then establish a TCP connection with the destination a TCP connection.

A portion of the Internet domain name space



* For example, cs.yale.edu could equally well be listed under the US country domain as cs.yale.ct.us.
* In practice, however, most organization in the united states are under a generic domain.
* organization except multinationals do it each domain controls how it allocates the domain under it.
* For example japan has domain ac.jp and co.jp that mirror edu and com.
* cs.yale.edu (Yale University, in the united stats)
* cs.vu.nl (vrije universiteit, in the Netherland)
* cs.keio.ac.jp (Keio university, in japan)
* To create a new domain, permission is required of the domain in which it will be included.

(11b) Discuss about audio compression. [5M]

Audio compression in computer network reduces digital sound file sizes too efficient storage and streaming by removing redundant data. Using lossy (MP3, AAC, discarding imperceptible reconstruction methods.

Audio preprocessing :-

Before diving into the compression techniques it is important to prepare the audio data for compression. This involves cleaning the audio, removing noise, various Audio editing software and libraries can assist in this preprocessing stage.

Choosing the compression Algorithm :-

once the Audio is preprocessed the next step is to choose the appropriate compression algorithm based on your requirement.

Encoding the Audio :-

Encoding is the process of converting the audio data into a compressed format using the chosen compression algorithm. This step determines how effectively the audio is compressed and the resolting file size.

Testing and Fine-tuning :-

After encoading it is essential to test the compressed audio to ensure it meets your quality expectations Fine-tuning may be nessary to adjust the compression settings and optimize the balance between file size and Audio quality.

Decoading and playback :-

once the Audio is compressed it needs to be decoded back to its original form for playback Ensure that the decoading process is compatible with the chosen compression algorithm and that the resulting audio quality is satisfactory for your intended use.

III B.Tech I sem End Examinations
(Regular) Dec-2025

COMPUTER NETWORKS

PART-A

1 a) Definition CN — 1M
(b) List out Guided & Unguided — 1M
(c) Design Issues — 1M
(d) Definition PPP — 1M
(e) Definition Network Routing — 1M
(f) N/W Address finding — 1M
(g) Responsibilities of TL — 1M
(h) Defnition Jitter — 1M
(i) functions of AL — 1M
(j) Defnitions of static & Dynamic web pages — 1M

PART-B

2) Diagram — 5M
Layer functionalities 5M } [10M]

3) List out CAN — 2M
Explanation — 6M
Diagrams — 2M } [10M]

4) Diagrams — 5M
Explanation — 5M } [10M]

5) a) Definition - 2 M
Explanation - 2 M
List out types - 1 m
} [5M]

b) Diagram - 2M
Explanation - 3M
} [5M]

6) Explanation - 5M
Diagram & Example - 5M
} [10M]

7) Diagram - 5M
Explanation - 5M
} [10M]

8) Diagram - 5M
Explanation - 5M
} [10M]

9) Diagram - 5M
Explanation - 5M
} [10M]

10) WWW - 5M
HTTP - 5M
} [10 M]

11 a) Explanation - 3M
Example - 2M
} [5M]

b) Explanation - [5M]