Explain two functions each of presentation and application layer.

Functions of Presentation Layer:

1. Data Translation and Formatting: Ensures data is presented in a format understandable by the receiving system
2. Syntax Negotiation: Manages the communication syntax between two systems.

Functions of Application Layer:

1. User Interface and Interaction**:** Provides the interface through which users interact with network services and applications.
2. Network Services Access: Enables access to various network services, such as: File transfer (FTP), Email (SMTP, POP3, IMAP) and Web browsing (HTTP)

Discuss direct and limited broadcast address.

Limited broadcast address is used for transmitting data from one source host to all other hosts residing in the same network

Direct broadcast address is used for transmitting data from one source host to all other hosts residing in some other network

Explain the fragmentation offset field of an IP datagram.

Fragment Offset field represents the number of data Bytes ahead of the particular fragment in a particular datagram.

Explain the redirection error message in ICMP protocol.

ICMP redirection error message is used to inform a host that a better route exists for a specific destination. It helps in network optimization and load balancing.

List four uses of UDP protocol.

1. **Voice over IP (VoIP):** Phone calls, video conferencing, online gaming
2. **Domain Name System (DNS):** Translates domain names into IP addresses
3. **SNMP (Simple Network Management Protocol):** Monitors and manages network devices
4. **DHCP (Dynamic Host Configuration Protocol):** Assigns IP addresses to devices

What do you mean by half close in TCP?

"half closed" means, that the connection was completely opened, but the handshake for closing the connection was never completed.

Explain Transient link in OSPF terminology.

When several routers are attached in a network, they are known as a transient link.

The transient link has two different implementations:
Unrealistic topology: When all the routers are connected to each other, it is known as an unrealistic topology.
Realistic topology: When some designated router exists in a network then it is known as a realistic topology.

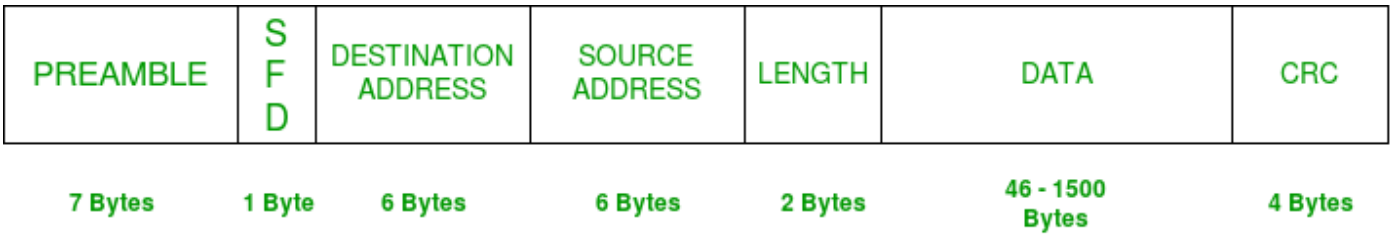
Explain Primary and Secondary servers used in DNS protocol.

Primary DNS Server holds the original copy of DNS records for a domain. It is responsible for responding to DNS queries directly. It allows modifications to DNS records

Secondary DNS Server maintains a read-only copy of DNS records obtained from the primary server. It Responds to DNS queries when the primary server is unreachable.

Explain four aspects of security i.e. privacy, integrity, authentication, nonrepudiation.

Explain the Ethernet frame format.



1. Preamble is used to protect the frame bits.
2. SFD warns station that this is the last chance for synchronization
3. Destination Address contains the MAC address of the destination
4. Source Address contains the MAC address of the source
5. Length indicates the length of the entire Ethernet frame.
6. Data is the place where actual data is inserted
7. CRC performs Cyclic Redundancy Check

Explain the various connecting devices:

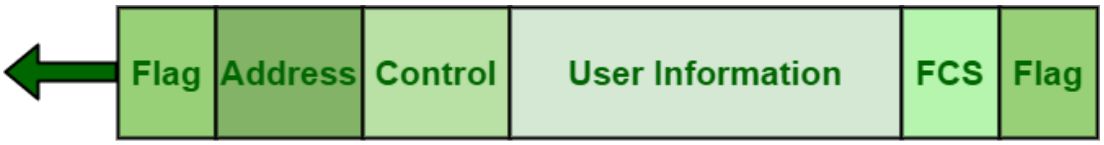
(i)Repeaters (ii) Hubs (iii) Bridges (iv) Router (v) Gateways

Device	Layer	Function
Repeater	Physical	Amplifies and regenerates signals to extend their range.
Hub	Physical	Connects multiple devices and broadcasts all data packets to all devices.
Bridge	Data Link	Filters and forwards data packets based on MAC addresses.
Switch	Data Link	Learns device MAC addresses and forwards data packets only to the intended device.
Router	Network	Connects multiple networks, chooses paths for data packets based on IP addresses, and manages routing tables.

Gateway	Network	Translates data between different protocols to enable efficient communication

Discuss the different types of HDLC frames and their fields.

1. **I-frame:** I-frame stands for Information frame. It is used for transporting user data from network layer.



I-frame

2. **S-frame:** S-frame stands for Supervisory frame. It is used for error control and flow control.

S-frame

3. **U-frame:** U-frame stands for Unnumbered frame. It is used for link setup and disconnection.

U-frame

What are character-oriented and bit-oriented protocols? Discuss byte stuffing and unstuffing along with bitstuffing and unstuffing in detail.

Character-Oriented Protocols: Interpret data as a series of characters (usually 8-bit bytes).

Bit-Oriented Protocols: Interpret data as a continuous stream of bits.

Byte Stuffing and Unstuffing:

1. Stuffing: When the sender encounters a data byte identical to the flag byte, it inserts an escape character (ESC) before it.
2. Unstuffing: The receiver removes the ESC character before delivering the data to the upper layers.

Bit Stuffing and Unstuffing:

1. Stuffing: When the sender encounters five consecutive 1 bits in the data, it inserts an extra 0 bit.
2. Unstuffing: The receiver removes the extra 0 bit after five consecutive 1 bits, restoring the original data.

Discuss the TCP segment format

Same as TCP header format

Discuss the time-exceeded message in ICMP protocol.

ICMP time-exceeded message is an error message sent by a router or host to indicate that a packet's Time to Live (TTL) field has reached zero before reaching its destination.

Explain any two types of addresses in IPv6.

Unicast Addresses:

- Identify a single network interface.
- Packets addressed to a unicast address are delivered to that specific interface.

Multicast Addresses:

- Identify a group of interfaces on multiple devices.
- Packets addressed to a multicast address are delivered to all members of the group.

Explain tunnelling related to VPN technology

Same as tunnelling a packet in WAN