SNS COLLEGE OF ENGINEERING

Kurumbapalayam (Po), Coimbatore – 641 107

AN AUTONOMOUS INSTITUTION

Approved by AICTE, New Delhi and Affiliated to Anna University, Chennai

INTERNAL ASSESSMENT EXAMINATION – I

Answer Key

V Semester

B.Tech - Information Technology

19IT401– Computer Networks

Regulations 2019

Duration   : 1 Hours 30 Minutes

Date   : 29.08.2024   Session : FN   **Maximum: 50 Marks**

Answer ALL questions

PART A - (5 X 2 = 10 marks)

1. **Define computer networks.**

   - Computer networking refers to interconnected computing devices that can exchange data and share resources with each other.   **(1)**

   - A network connection between these devices can be established using cable or wireless media.   **(1)**

2. **Outline the metrics used to access the performance of computer networks.**   **(2)**

   - Bandwidth
   - Latency
   - Packet Loss
   - Jitter

3. **What is Point to Point WAN and Switched WAN? Give Example.**

   - A point-to-point WAN is a type of network topology that connects two locations using a dedicated circuit.   **(1)**

   - In switched WAN, multiple component LANs are connected via a shared networking infrastructure.   **(1)**

4. **Summarize the uses of ARP.**

- Address Resolution Protocol (ARP) The Address Resolution Protocol is a layer 2 protocol used to map MAC addresses to IP addresses. **(1)**

- Without ARP, a host would not be able to figure out the hardware address of another host. **(1)**

5. **List different types of multiple access protocols.** **Any 2 (2)**

- Random access protocols
- Controlled access protocols and
- Channelization protocols**.**

PART B - (2 X 13 = 26 marks)

6.(a) Discuss the different types of computer networks and their key characteristics. Analyze how each network type can be applied to different segments of ConnectCorp's operations.

- A computer network is a cluster of computers over a shared communication path that works to share resources from one computer to another, provided by or located on the network nodes. **(1)**

Uses of Computer Networks **(2)**

- Communicating using email, video, instant messaging, etc.
- Sharing devices such as printers, scanners, etc.
- Sharing files.
- Sharing software and operating programs on remote systems.
- Allowing network users to easily access and maintain information.

Types of Computer Networks **(2)**

- **Personal Area Network (PAN)**
- **Local Area Network (LAN)**
- **Metropolitan Area Network (MAN)**
- **Wide Area Network (WAN)**

Personal Area Network (PAN) **(2)**

- It is the most basic type of computer network.
- It is a type of network designed to connect devices within a short range, typically around one person.

**Examples of PAN are USB, computer, phone, tablet, printer, PDA, etc.**
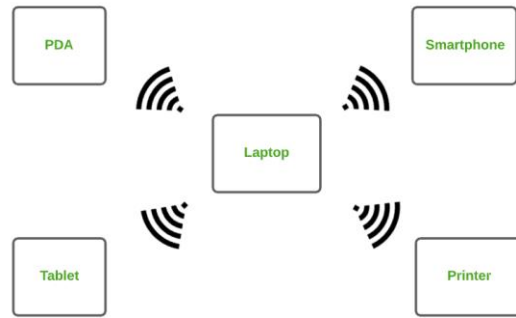
Applications of PAN

- Home and Offices
- Organizations and the Business sector
- Medical and Hospital
- School and College Education
- Military and Defense

Local Area Network (LAN) (2)

- LAN is the most frequently used network.
- A LAN is a computer network that connects computers through a common communication path, contained within a limited area, that is, locally.
- Examples of LAN are networking in a home, school, library, laboratory, college, office, etc.
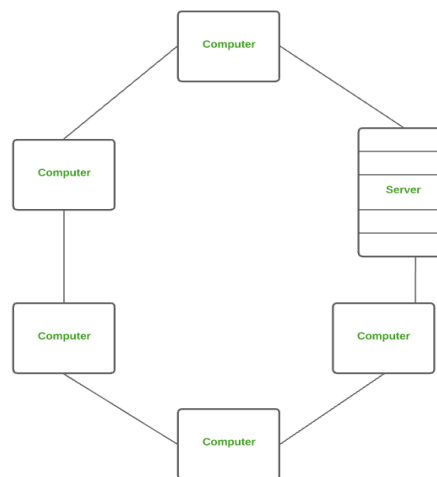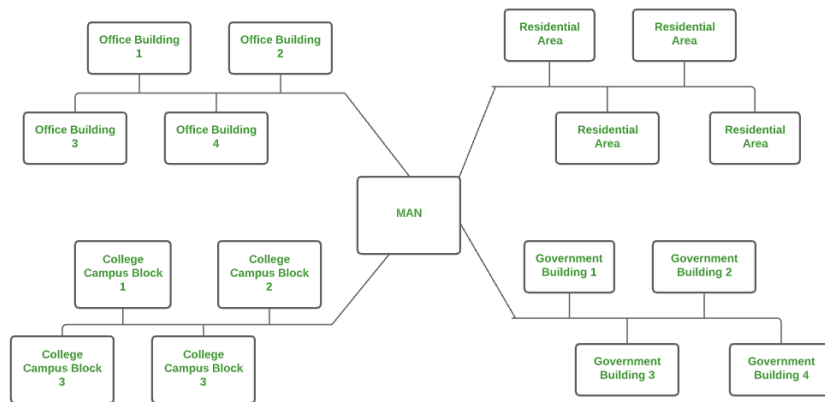

Advantages:

- Privacy
- High Speed
- Supports different transmission mediums

- Inexpensive and Simple

Metropolitan Area Network (MAN) (2)

- A MAN is larger than a LAN but smaller than a WAN.
- This is the type of computer network that connects computers over a geographical distance through a shared communication path over a city, town, or metropolitan area.
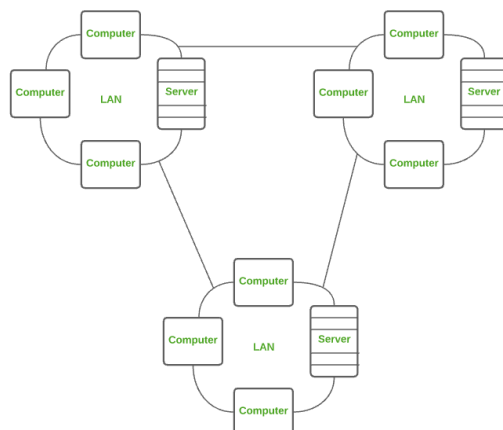

Advantages of MAN

- High-speed connectivity
- Security level in MAN is high
- MAN can serve multiple users at a time
- Centralized management and control of the network

Wide Area Network (WAN): (2)

- WAN is a type of computer network that connects computers over a large geographical distance through a shared communication path. It is not restrained to a single location but extends over many locations.

Advantages:

- It covers large geographical area

- The data can be stored in centralized manner

- WAN enables a user or organisation to connect with the world very easily

(b) Evaluate the different types of guided media in terms of their characteristics, performance and suitability for data center environments. Discuss the advantages and disadvantages of each medium, considering factors like bandwidth capacity, installation complexity, and long term reliability.

Definition of Transmission Medium: **(1)**

- A transmission medium is a physical path between the transmitter and the receiver i.e. it is the channel through which data is sent from one place to another.

GUIDED MEDIA: **(1)**

- Guided Media is also referred to as Wired or Bounded transmission media. Signals being transmitted are directed and confined in a narrow pathway by using physical links.

Features:

- High Speed
- Secure
- Used for comparatively shorter distances

Types: **(1)**

- **Twisted Pair Cable**

- **Coaxial Cable**

- **Optical Fiber Cable**

Twisted Pair Cable: **(2)**

It consists of 2 separately insulated conductor wires wound about each other.

Unshielded Twisted Pair (UTP): UTP consists of two insulated copper wires twisted around one another. This type of cable has the ability to block interference and does not depend on a physical shield for this purpose. It is used for telephonic applications.
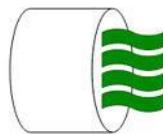
Unshielded Twisted Pair

Advantages of Unshielded Twisted Pair

- Least expensive

- Easy to install
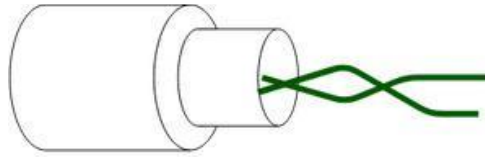
- High-speed capacity

Disadvantages of Unshielded Twisted Pair

Susceptible to external interference

Shielded Twisted Pair: (2)

- This type of cable consists of a special jacket (a copper braid covering or a foil shield) to block external interference.
- It is used in fast-data-rate Ethernet and in voice and data channels of telephone lines.

Shielded Twisted Pair

Advantages

- Better performance at a higher data rate in comparison to UTP
- Eliminates crosstalk
- Comparatively faster

Disadvantages

- Comparatively difficult to install and manufacture
- More expensive
- Bulky

Coaxial Cable: (3)

- It has an outer plastic covering containing an insulation layer made of PVC or Teflon and 2 parallel conductors each having a separate insulated protection cover. The coaxial cable transmits information in two modes:
- Baseband mode(dedicated cable bandwidth) and
- Broadband mode (cable bandwidth is split into separate ranges). Cable TVs and analog television networks widely use Coaxial cables.
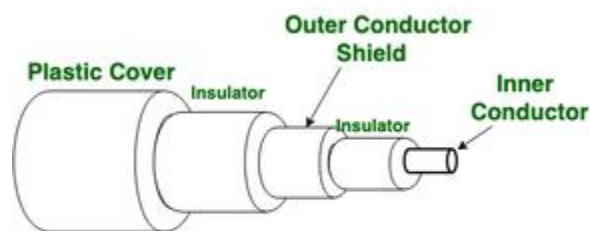
Figure of Coaxial Cable

Advantages of Coaxial Cable

- High bandwidth.
- Easy to install coaxial cables.

- Coaxial cables have better cut-through resistance so they are more reliable and durable.
- Less affected by noise or cross-talk or electromagnetic inference.
- Coaxial cables support multiple channels

Disadvantages of Coaxial Cable

- Coaxial cables are expensive.
- The coaxial cable must be grounded in order to prevent any crosstalk.
- As a Coaxial cable has multiple layers it is very bulky.
- There is a chance of breaking the coaxial cable and attaching a "t-joint" by hackers, this compromises the security of the data.

Optical Fiber Cable: (2)

- Optical Fiber Cable uses the concept of refraction of light through a core made up of glass or plastic.
- The core is surrounded by a less dense glass or plastic covering called the cladding.
- It is used for the transmission of large volumes of data. The cable can be unidirectional or bidirectional.
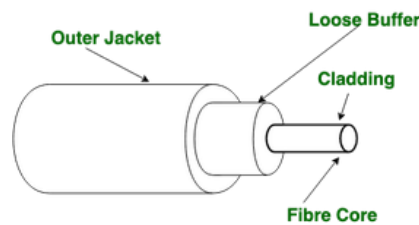

Figure of Optical Fibre Cable

Advantages of Optical Fibre Cable

- Increased capacity and bandwidth
- Lightweight
- Less signal attenuation
- Immunity to electromagnetic interference
- Resistance to corrosive materials

Disadvantages of Optical Fibre Cable

- Difficult to install and maintain
- High cost
- Fragile

Applications of Optical Fibre Cable   (1)

- **Medical Purpose:** Used in several types of medical instruments.
- **Defence Purpose:** Used in transmission of data in aerospace.

- **For Communication:** This is largely used in formation of internet cables.
- **Industrial Purpose:** Used for lighting purposes and safety measures in designing the interior and exterior of automobiles.

7.(a) Examine the capabilities of Point-to-Point Protocol (PPP) in supporting secure and reliable data communication across TechTransit's network.

Point-to-point Protocol: (2)

- Point - to - Point Protocol (PPP) is a communication protocol of the data link layer that is used to transmit multiprotocol data between two directly connected (point-to-point) computers.
- It is a byte - oriented protocol that is widely used in broadband communications having heavy loads and high speeds.

Services Provided by PPP (2)

- Defining the frame format of the data to be transmitted.
- Defining the procedure of establishing link between two points and exchange of data.
- Stating the method of encapsulation of network layer data in the frame.
- Stating authentication rules of the communicating devices.
- Providing address for network communication.
- Providing connections over multiple links.
- Supporting a variety of network layer protocols by providing a range os services.

PPP Frame Format: (5)
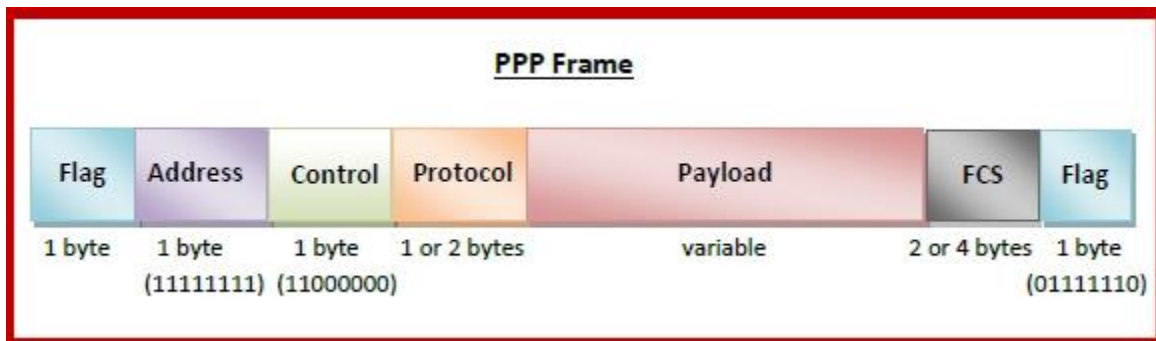
- **Flag** − 1 byte that marks the beginning and the end of the frame. The bit pattern of the flag is 01111110. (4)
- **Address** − 1 byte which is set to 11111111 in case of broadcast.
- **Control** − 1 byte set to a constant value of 11000000.
- **Protocol** − 1 or 2 bytes that define the type of data contained in the payload field.
- **Payload** − This carries the data from the network layer. The maximum length of the payload field is 1500 bytes. However, this may be negotiated between the endpoints of communication.

- **FCS** − It is a 2 byte or 4 bytes frame check sequence for error detection. The standard code used is CRC (cyclic redundancy code)

OR

(b) Analyze the role of different Data Link Control (DLC) protocols in ensuring reliable and secure data transmission within SecureComm's network. Discuss the operational characteristics of key DLC protocols.
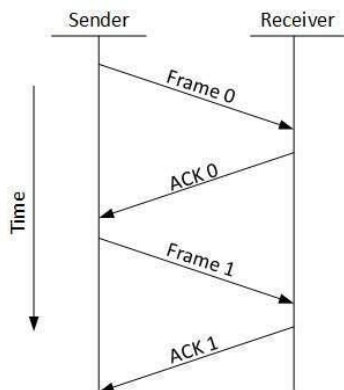
- Data-link layer is responsible for implementation of point-to-point flow and error control mechanism. **(1)**

Flow Control (2)

Two types of mechanisms can be deployed to control the flow:
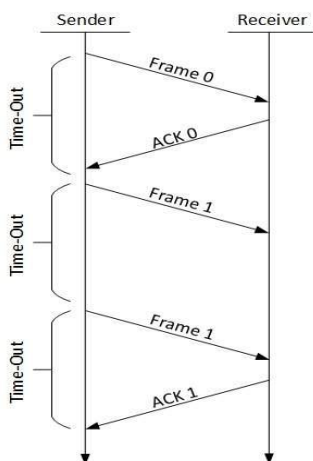
Stop and Wait
- The sender after transmitting a data frame to stop and wait until the acknowledgement of the data-frame sent is received.

Sliding Window (2)

- In this flow control mechanism, both sender and receiver agree on the number of data-frames after which the acknowledgement should be sent. **Error Control**
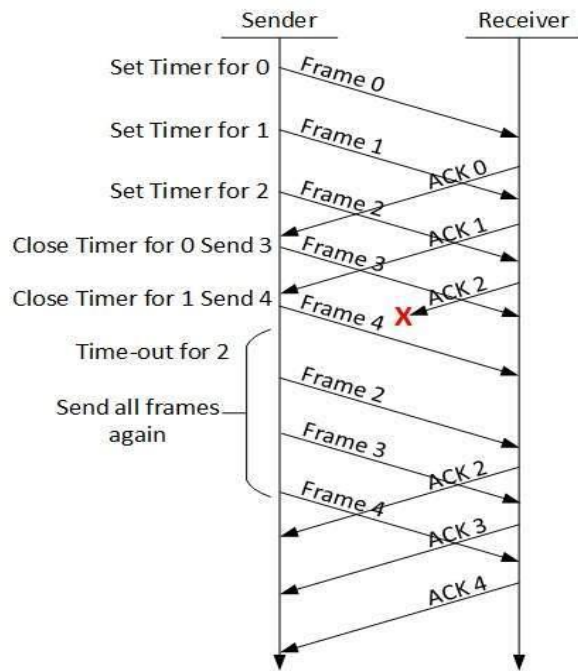- **Stop-and-wait ARQ**

Go-Back-N ARQ (4)

Stop and wait ARQ mechanism does not utilize the resources at their best. When the acknowledgement is received, the sender sits idle and does nothing. In Go-Back-N ARQ method, both sender and receiver maintain a window.

Selective Repeat ARQ: (4)

- In Go-back-N ARQ, it is assumed that the receiver does not have any buffer space for its window size and has to process each frame as it comes. This enforces the sender to retransmit all the frames which are not acknowledged.
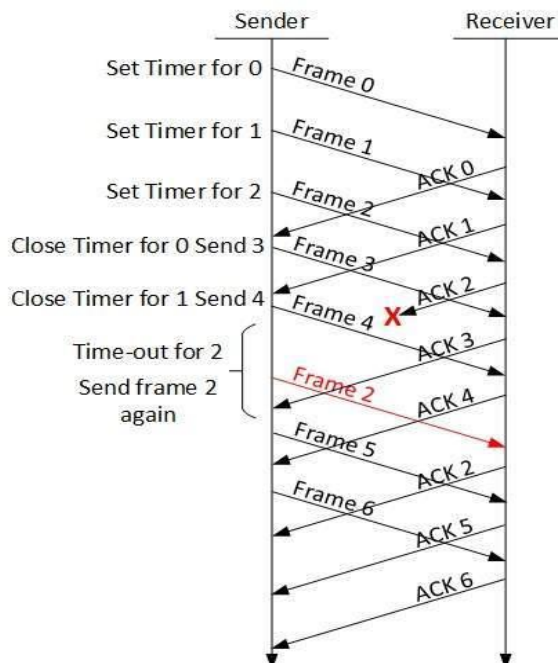
8. (a)ABC Corporation is a mid-sized company specializing in software development, with headquarters in New York and a branch office in San Francisco. As part of its expansion, ABC Corporation is upgrading its network infrastructure to improve communication between its offices and ensure secure, reliable access to company resources. The new network must support various applications, including video conferencing, cloud-based project management tools, secure email, and remote access for employees working from different locations by OSI reference model.

OR

(b) As the lead network engineer at GlobalTech, you are tasked with diagnosing and resolving the communication issues within the HDLC-managed network. To do this, you must thoroughly analyze the HDLC protocol's frame types and control fields, determine the root causes of the observed problems, and propose actionable solutions to enhance network performance.

Definition: (2)

- High-level Data Link Control (HDLC) is a group of communication protocols of the data link layer for transmitting data between network points or nodes.
- It is a data link protocol, data is organized into frames. A frame is transmitted via the network to the destination that verifies its successful arrival.
- It is a bit - oriented protocol that is applicable for both point - to - point and multipoint communications.

HDLC Frame format: (7)
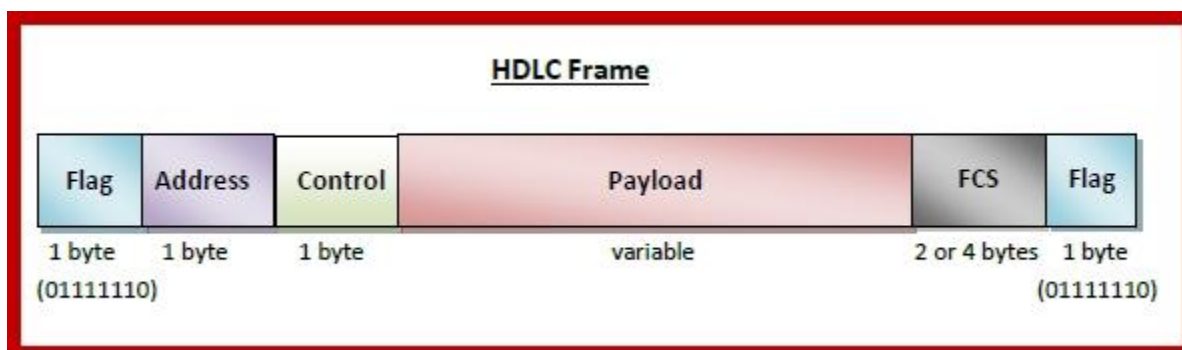
Flag − It is an 8-bit sequence that marks the beginning and the end of the frame. The bit pattern of the flag is 01111110.

Address − It contains the address of the receiver. If the frame is sent by the primary station, it contains the address(es) of the secondary station(s). If it is sent by the secondary station, it contains the address of the primary station. The address field may be from 1 byte to several bytes.
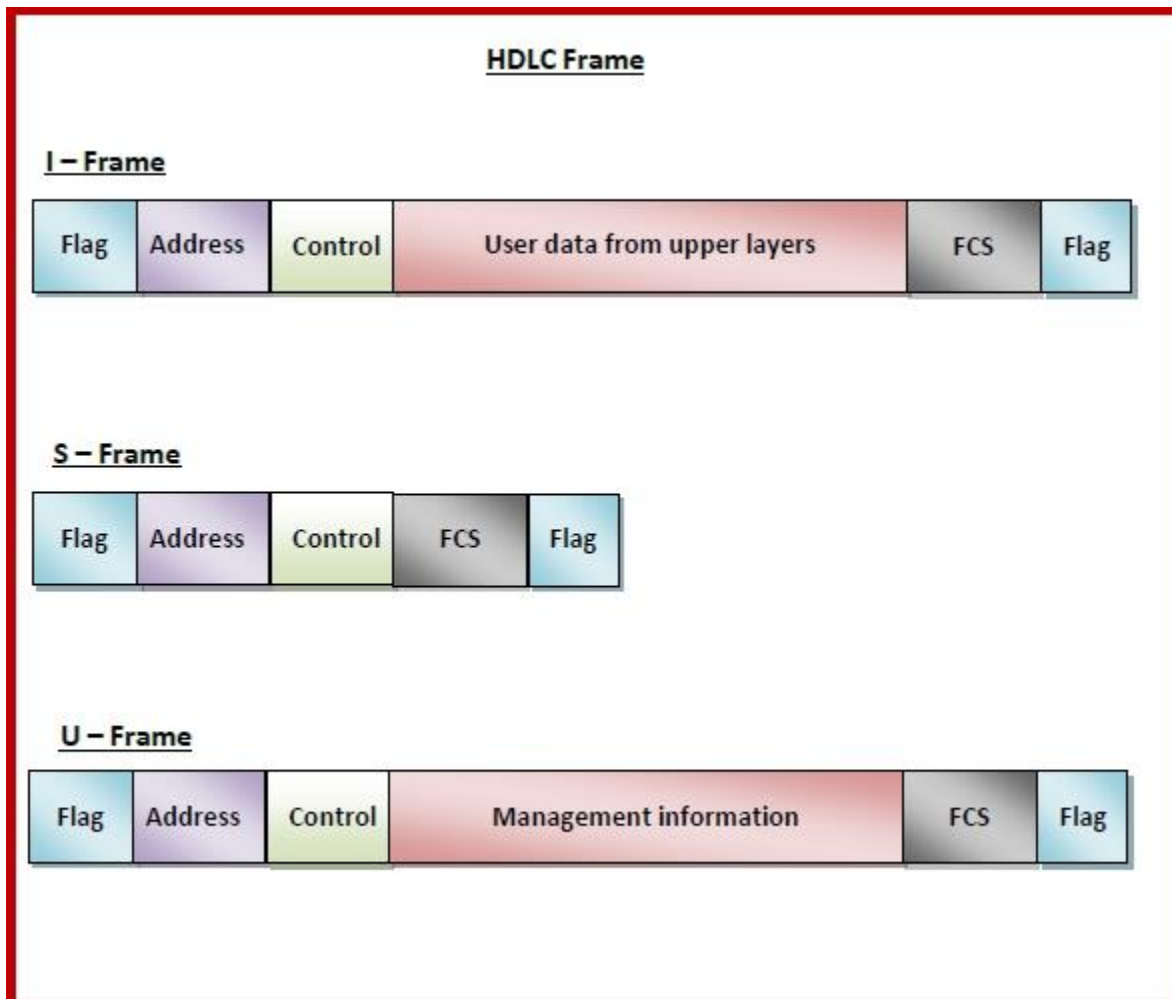
Control − It is 1 or 2 bytes containing flow and error control information.

Payload − This carries the data from the network layer. Its length may vary from one network to another.

FCS − It is a 2 byte or 4 bytes frame check sequence for error detection. The standard code used is CRC (cyclic redundancy code)

Types of HDLC Frames   (4)

     Faculty Incharge   **HoD**   **Principal**