**Week-1**

**VIVA-VOCE**

**1. What is bit stuffing? What is the use of bit stuffing?**

Bit stuffing is the process of inserting non-information bits into data to break up bit patterns to affect the synchronous transmission of information. Bit stuffing is commonly used to bring bit streams up to a common transmission rate or to fill frames.

**2. What is character stuffing? What is the use of character stuffing?**

In byte stuffing (or character stuffing), a special byte is added to the data section of the frame when there is a character with the same pattern as the flag. The data section is stuffed with an extra byte. Each frame starts with the ASCII character sequence DLE STX and ends with the sequence DLE ETX.(where DLE is Data Link Escape, STX is Start of TeXt and ETX is End of TeXt.) This method overcomes the drawbacks of the character count method. If the destination ever loses synchronization, it only has to look for DLE STX and DLE ETX characters.

**3**. **By which special bit pattern the frame begins and ends?**

 Each frame begins and ends with a special bit pattern called a flag byte [01111110].

**4. What are the functions of data link layer?**

1) It provides well-defined service interface to the network layer on source machine to the network layer on destination machine.

2) The source machine sends data in blocks called frames to the destination machine. The starting and ending of each frame should be recognized by the destination machine.

3) The source machine must not send data frames at a rate faster than the destination machine can accept them.

**5. Name the delimiters for character stuffing?**

A) Each frame starts with the ASCII character sequence DLE STX and ends with the sequence DLE ETX

**6. Expand DLE STX and DLE ETX?**

DLE is Data Link Escape, STX is Start of TeXt

DLE is Data Link Escape, ETX is End of TeXt.

**Week-2**

**VIVA-VOCE**

1. **What is CRC?**

A cyclic redundancy check (CRC) is an [error-detecting code](https://en.wikipedia.org/wiki/Error_detection_and_correction) commonly used in digital [networks](https://en.wikipedia.org/wiki/Telecommunications_network) and storage devices to detect accidental changes to raw data. Blocks of data entering these systems get a short check value attached, based on the remainder of a [polynomial division](https://en.wikipedia.org/wiki/Polynomial_long_division) of their contents. On retrieval, the calculation is repeated and, in the event the check values do not match, corrective action can be taken against data corruption. CRCs can be used for [error correction](https://en.wikipedia.org/wiki/Error_correcting_code) .

1. **What is the use of CRC?**

The use of cyclic codes, which encode messages by adding a fixed-length check value, for the purpose of error detection in communication networks.

1. **Name the CRC standards for generator polynomial?**

CRC-12: **x12+x11+x3+x2+x+1**

CRC- 16: **X16+x15+x2+1**

CRC-CCITT**: x16+x12+x5+1**

1. **How do you convert generator polynomial into binary form?**

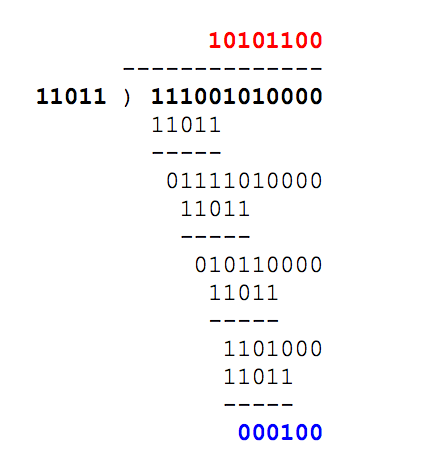
The generator polynomial is converted into the binary form by considering coefficients of polynomial

EX: x12+x11+x3+x2+x1+1 = 1100000001111

1. **Define checksum?**

A checksum is a simple type of redundancy check that is used to detect errors in data

1. **How do you perform binary division operation in CRC?**



**Week-3**

**VIVA-VOCE:**

1. **Explain Stop and Wait protocol?**

The stop and wait protocol is a flow control protocol where flow control is one of the services of the data link layer It is a data-link layer protocol which is used for transmitting the data over the noiseless channels. It provides unidirectional data transmission which means that either sending or receiving of data will take place at a time. It provides flow-control mechanism but does not provide any error control mechanism.

1. **Explain the features of Stop and Wait protocol?**

The features of Stop and Wait Protocol are as follows −

* It is used in Connection-oriented communication.
* It offers error and flows control.
* It can be used in data Link and transport Layers.
* Stop and Wait ARQ executes Sliding Window Protocol with Window Size

1. **What are the responsibilities of data link layer?**

Specific responsibilities of data link layer include the following.

* + Framing
  + Physical addressing
  + Flow control
  + Error control
  + Access control

1. **Mention the categories of flow control.**

There are 2 methods have been developed to control flow of data across communication links.

* Stop and wait- send one from at a time.
* Sliding window- send several frames at a time.

**Week-4**

**VIVA-VOCE:**

1. **Explain sliding Window protocol?**

A sliding window protocol is a feature of packet-based data transmission protocols. Sliding window protocols are used where reliable in-order delivery of packets is required, such as in the Data Link Layer (OSI layer 2) as well as in the Transmission Control Protocol (TCP).

1. **What are the different types of sliding window protocols?**

1. [Stop and wait Protocol](http://www.rpi.edu/locker/75/000475/main/subsubsection3_8_2_1.html#SECTION0008210000000000000)

2. [GO-BACK-N (GBN) Protocol](http://www.rpi.edu/locker/75/000475/main/subsubsection3_8_2_2.html#SECTION0008220000000000000)

3. [Selective Repeat Protocol (SRP)](http://www.rpi.edu/locker/75/000475/main/subsubsection3_8_2_3.html#SECTION0008230000000000000)

1. **Explain the benefits of sliding window protocol?**
2. It controls the speed of transmission so that no fast sender can overwhelm the slower receiver;
3. It allows for orderly delivery
4. It allows for retransmission of lost frames, specific retransmission policy depends on the specific implementations.
5. **What are the functionalities of data link layer?**

Data link layer deals with transmission errors

* 1. regulate the flow of data
  2. Provide a well-defined interface to the network layer.

1. **Explain the difference between the sliding protocols?**

**Stop and wait –**

Sender window size (Ws) = 1

Receiver window size (Wr) = 1

Sequence Number >= 1 + 1

Uses independent acknowledgement

Discards out of order packets

Packet Loss → Retransmit packet after time out

1. Acknowledgement loss → Resends packet after time out
2. Efficiency = 1/(1+2a) where a = Tp/Tt

**Go Back N –**

1. Sender window size Ws = N
2. Receiver window size Wr = 1
3. Sequence number >= N + 1
4. Can use both cumulative or independent acknowledgement depends on acknowledge timer
5. Discards out of order packets
6. Packet Loss → Track back N size from the last packet within the window limit to the lost packet and retransmit them
7. Acknowledgement loss → If not received before timeout the entire window N size is resend
8. Efficiency = N/(1+2a) where a = Tp/Tt

**Selective Repeat –**

1. Sender window size Ws = N
2. Receiver window size Wr = N
3. Sequence Number >= N + N
4. Uses only independent acknowledgement
5. Can Accept out of order packets
6. Packet Loss → Resend only the lost packet after timeout
7. Acknowledgement loss → Resend if not receive before timeout
8. Efficiency = N/(1+2a) where a = Tp/Tt

**6. What is piggy backing? Why?**

**Piggybacking** data is a bit different from Sliding Window Protocol **used** in the OSI model. In the data frame itself, we incorporate one additional field for acknowledgment (called ACK). ... If station A wants to send both data and an acknowledgment, it keeps both fields there.

**Week-5**

**VIVA VOCE:**

1. **What is Flow based routing algorithm?**

Flow-based routing seeks to find a routing table to minimize the average packet delay through the subnet.

1. **What is the Link state routing algorithm?**

Link State improves the convergence of Distance Vector by having everybody share their idea of the state of the net with everybody else (more information is available to nodes, so better routing tables can be constructed).

1. **In shortest path which metric is considered?**

Shortest Path Metric is used in shortest path Routing Algorithm

1. **What is the another name for shortest path algorithm?**

### Another name for Shortest Path Algorithm is [Dijkstra's algorithm](https://en.wikipedia.org/wiki/Dijkstra%27s_algorithm)

1. **What is the disadvantage of Dijkstra’s algorithm?**

The major disadvantage of the algorithm is the fact that it does a blind search there by consuming a lot of time waste of necessary resources. Another disadvantage is that it cannot handle negative edges. This leads to acyclic graphs and most often cannot obtain the right shortest path.

1. **What is the advantage of Dijkstra’s algorithm?**

1) It is used in Google Maps

2) It is used in finding Shortest Path.

3) It is used in geographical Maps

4) To find locations of Map which refers to vertices of graph.

5) Distance between the location refers to edges.

6) It is used in IP routing to find Open shortest Path First.

**Week-6**

**VIVA-VOCE:**

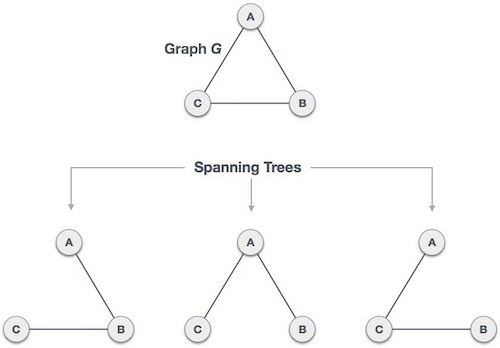
1. **What is spanning tree?**

Spanning Tree Protocol. The Spanning Tree Protocol (STP) is a network protocol that builds a loop-free logical topology for Ethernet networks

1. **What is broadcasting?**

**Broadcast**: Here, traffic streams from a single point to all possible endpoints within reach on the network, which is generally a LAN. This is the easiest technique to ensure traffic reaches to its destinations.

1. **Design the spanning tree.**



1. **What is reverse path forwarding?**

Reverse path forwarding. Reverse path forwarding (RPF) is a technique used in modern routers for the purposes of ensuring loop-free forwarding of multicast packets in multicast routing and to help prevent IP address spoofing in unicast routing.

1. **How spanning tree helps to broadcast the message?**

The need for the Spanning Tree Protocol (STP) arose because [switches](https://en.wikipedia.org/wiki/Network_switch) in [local area networks](https://en.wikipedia.org/wiki/Local_area_networks) (LANs) were often interconnected using redundant links to improve resilience should one connection, called a link, fail. However, this was found to create transmission loops, [broadcast storms](https://en.wikipedia.org/wiki/Broadcast_storm) and MAC address table trashing. If redundant links are used to connect switches, then transmission loops need to be avoided[[4]](https://en.wikipedia.org/wiki/Spanning_Tree_Protocol#cite_note-4) because [data link layer](https://en.wikipedia.org/wiki/Data_link_layer) 2 [Ethernet frames](https://en.wikipedia.org/wiki/Ethernet_frame) do not expire. Potentially an Ethernet frame with a destination [MAC address](https://en.wikipedia.org/wiki/MAC_address) that is not in the MAC address table of the immediate switch can be bounced around between switches in the local area network. Redundant links between these switches could result in the Ethernet frame never reaching a Switch that has the destination MAC address in its MAC address table. In such cases switches also broadcast the Ethernet frames to all ports, except the one from which it entered. This can create a broadcast storm

6. **What is the difference between Unicast, multicast and Broadcast?**

**Unicast**: traffic, many streams of IP packets that move across networks flow from a single point, such as a website server, to a single endpoint such as a client PC. This is the most common form of information transference on networks.

**Broadcast**: Here, traffic streams from a single point to all possible endpoints within reach on the network, which is generally a LAN. This is the easiest technique to ensure traffic reaches to its destinations.

**Multicast:**In this method traffic recline between the boundaries of unicast (one point to one destination) and broadcast (one point to all destinations). And multicast is a “one source to many destinations” way of traffic distribution, means that only the destinations that openly point to their requisite to accept the data from a specific source to receive the traffic stream.

**Week-7**

**VIVA –VOCE:**

**1. Explain ARP**

Address Resolution Protocol (**ARP**) is a protocol for mapping an Internet Protocol address (IP address) to a physical machine address that is recognized in the local network. For example, in IP Version 4, the most common level of IP in use today, an address is 32 bits long.

**2. Explain the purpose of Network layer?**

The network layer provides the means of transferring variable-length network packets from a source to a destination host via one or more networks. ... Host addressing. Every host in the network must have a unique address that determines where it is.

**3**. **What Is The Use Of Arp?**

A host in an Ethernet network can communicate with another host, only if it knows the Ethernet address (MAC address) of that host. The higher level protocols like IP use a different kind of addressing scheme (like IP address) from the lower level hardware addressing scheme like MAC address. ARP is used to get the Ethernet address of a host from its IP address. ARP is extensively used by all the hosts in an Ethernet network.

**4. To Which OSI Layer Does Arp Belong?**

ARP belongs to the OSI data link layer (Layer 2). ARP protocol is implemented by the network protocol driver. ARP packets are encapsulated by Ethernet headers and transmitted.

**5. Explain RARP?**

The Reverse Address Resolution Protocol (**RARP**) is an obsolete computer networking protocol used by a client computer to request its Internet Protocol (IPv4) address from a computer network, when all it has available is its link layer or hardware address, such as a MAC address.

**6. What is the difference between ARP and RARP?**

Address Resolution Protocol is utilized for mapping IP network address to the hardware address that uses data link protocol.

Reverse Address Resolution Protocol is a protocol using which a physical machine in a LAN could request to find its IP address from ARP table or cache from a gateway server.