# Summer 15

1. **In brief describe OSI model with suitable diagram.**
   (Layered structure 1 mark and explanation 3 marks)

Answer: OSI model (open system interconnection) model was developed by ISO(international standard organization)

Function of OSI model

- It provides way to understand how internet work operates.
- It gives guideline for creating network standard. OSI model has 7 layers as shown in the figure.
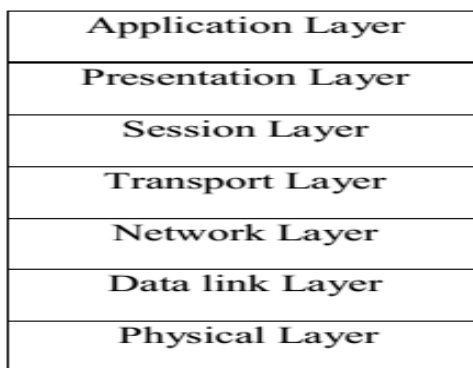
- OSI model has following 7 layers as Physical layer, data link layer, Network layer, Transport layer, session layer, presentation layer, application layer.

1) Physical layer: It co-ordinates the functions required to transmit bit stream over physical medium. It deals with mechanical and electrical specifications of interface and transmission medium. For transmission it defines procedures and functions that devices and transmission medium has to perform.

2) Data link layer: It is responsible for transmitting group of bits between the adjacent nodes. The group of bits is called as frame. The network layer passes a data unit to the data link layer. Header and trailer is added to the data unit by data link layer. This data unit is passed to the physical layer. Data link layer is responsible for moving frames from one node to the next.

Functions of data link layer are:

1) Framing
2) Physical addressing
3) Flow control
4) Error control
5) Media access control
6) Node to node delivery

3) Network layer: It is responsible for routing the packets within the subnet i.e. from source to destination. It is responsible for source to destination delivery of individual packets across multiple networks. It ensures that packet is delivered from point of origin to destination.
Functions of network layer:

1) Logical addressing
2) Routing.
3) Congestion control
4) Accounting and billing
5) Address transformation
6) Source host to destination host error free delivery of packet.

4) **Transport layer:** Responsibility of process to process delivery of message Ensure that whole message arrives in order.

Functions of Transport Layer:
1) Service point addressing
2) Segmentation and reassembly
3) Connection control
4) Flow control: Flow control is performed end to end
5) Error control.

5) Session layer: Establishes, maintains, and synchronizes the interaction among communication systems It is responsible for dialog control and synchronization.

Functions of Session Layer

1) Dialog control
2) Synchronization, session and sub session
3) Session closure

6) **Presentation layer:** It is concerned with syntax, semantics of information exchanged between the two systems.
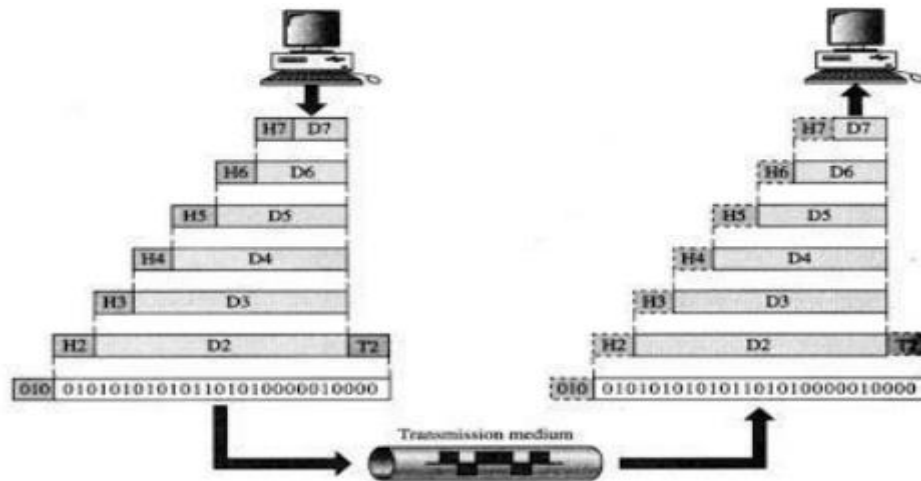
Functions:

1) Translation,
2) encryption,
3) compression

7) **Application layer: It** enables user to access the network. It provides user interfaces and support for services like email, remote file access.

Functions:

1) network virtual terminal,
2) file transfer access and management,
3) mail services and directory services.

2. **Explain data encapsulation in OSI**
   (Diagram of data encapsulation 2 marks , explanation 2 marks)


Each layer in the layered architecture provides service to the layers which are directly above and below it. The outgoing information will travel down through the layers to the lowest layer. While moving down on the source machine, it acquires all the control information which is required to reach the destination machine. The control information is in the form of headers and trailers which surrounds the data received from the layer above. This process of adding headers and trailers to the data is called as data encapsulation. The headers and trailers contain control information in the individual fields. It is used to make message packet reach the destination. The headers and trailers form the envelope which carries the message to the desired destination.

3. **With the help of neat sketch describe the working of router. Describe in detail the operation of router considering OSI model. (Explanation of Router 4M, Description of Router in OSI 4M)**

Answer: Router is a device that connects two or more computer network together this allows two or more disparate computer network to send data to each other.
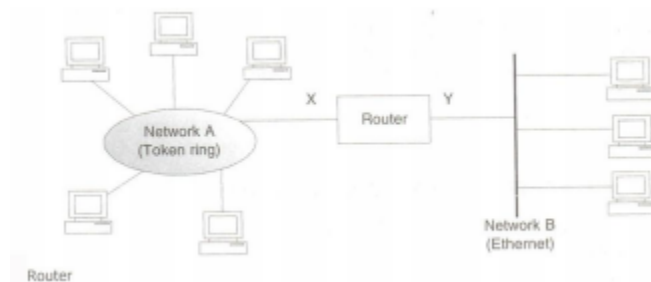
The figure shows a router connecting to two networks viz: A (Token Ring) and B (Ethernet) at points X and Y respectively. This means that the router must have two interfaces and also two Network interface cards (NICs) one to interact with network A at point X, and the other to interact with network B at point Y. this enable it to send data between the two networks A and B. a router connect more than two networks.
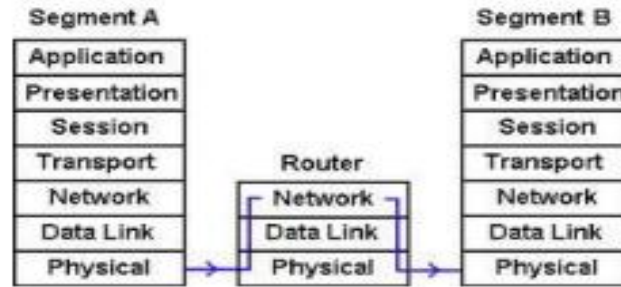
A router operates at a the physical, data link and network layer of the OSI model, as shown in fig a router is termed as an intelligent device. A router is useful for interconnecting two or more networks. These networks can be heterogeneous, which means that they can differ in their physical characteristics such as frame size, transmission rates, topologies, addressing etc. thus, if a router has to connect such different networks, it has to consider all these issues. A router has to determine the best possible transmission path among several available.

4. **Describe connection oriented and connectionless services.**
   (Connection oriented services 2 marks and connectionless services 2 marks)

Answer:

- **Connection-oriented** communication includes the steps of setting up a call from one computer to another, transmitting/receiving data, and then releasing the call, just like a voice phone call. However, the network connecting the computers is a packet switched network, unlike the phone system's circuit switched network. Connection-oriented communication is done in one of two ways over a packet switched network: with and without virtual circuits. Connection oriented service is more reliable than connectionless service. We can send the message in connection oriented service if there is an error at the receivers end. Example of connection oriented is **TCP (Transmission Control Protocol)** protocol.

- **Connectionless communication** is just packet switching where no call establishment and release occur. A message is broken into packets, and each packet is transferred separately. Moreover, the packets can travel different route to the destination since there is no connection. Connectionless service is typically provided by the **UDP (User Datagram Protocol.** The packets transferred using UDP are also called **datagrams**.

Difference between connection oriented and connectionless services:

1. In connection oriented service **authentication** is needed while connectionless service does not need any authentication.
2. Connection oriented protocol makes a connection and checks (confirms delivery of message) whether message is received or not and sends again if an error occurs connectionless service protocol does not guarantees a delivery.
3. Connection oriented service is more **reliable** than connectionless service.
4. Connection oriented service interface is **stream based** and connectionless is **message based.**

Winter-14

1. **Why layered architecture is used in OSI reference model? Discuss.**
   (Explanation-3 marks, diagram 1 mark)
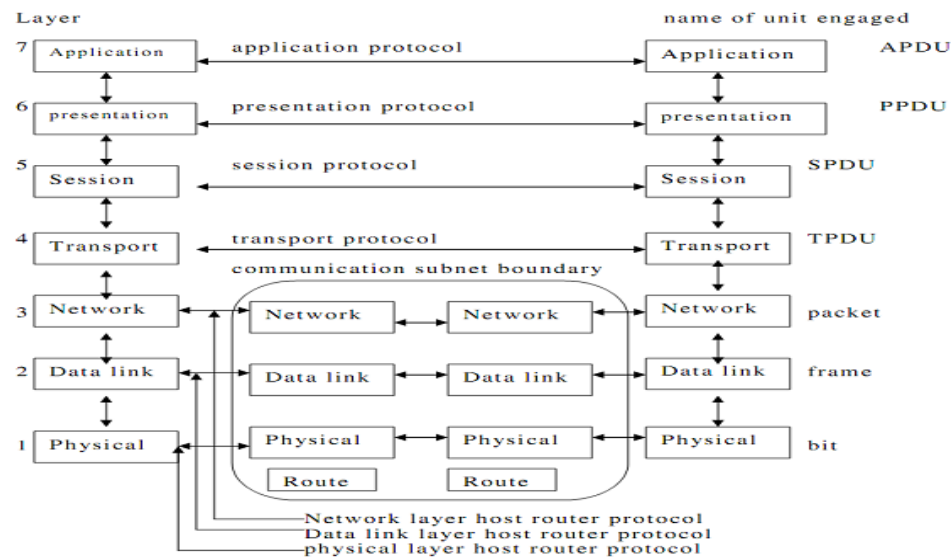
The OSI reference model is as shown in the figure. There are seven layers in the model. Physical layer, Data link layer, Network layer, Transport layer, Session layer, Presentation layer, Application layer.

Each layer performs unique and specific task and it offers services to the layer above it.

Each computer on a network uses a series of protocols to perform the functions assigned to each layer. At the top of the stack is the application layer and at the bottom is the physical medium which actually connects the computers to form a network.

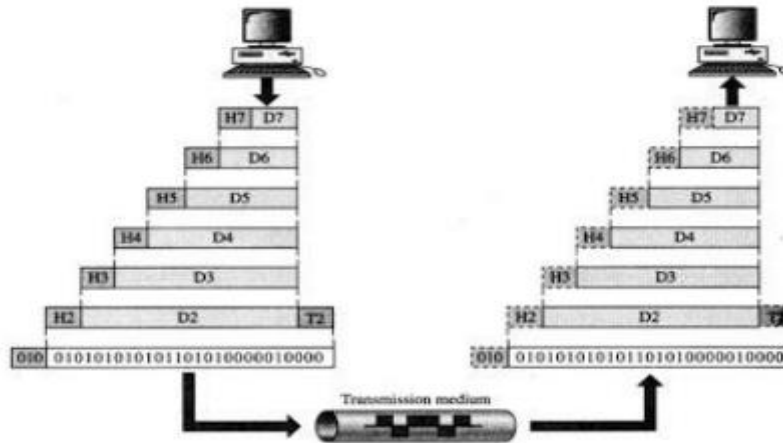The figure shows the OSI model with two hosts A and B, communicating with each other.

Interface: an interface defines the operations and services offered by lower layer to the upper layer. This is an interface between each pair of adjacent layers as shown in the figure.

Peer: the entities comprising the corresponding layers on different machines are called as peers. The communication actually takes place between the peers using the protocols.

Exchange of information: at the physical layer the communication is direct that is, machine A sends a stream of bits to machine B. At higher layers each layer in the sending machines adds its own information to the message it receives from the layer just above it and passes the whole package to the layer just below it.

The information added by each layer is in the form of headers or trailers. At layer 1 the entire package is converted to a form that can be transferred to the receiving machine.

2. **Explain encapsulation with example. (Diagram 1 mark, explanation 1 mark, example 2 mark)**

Each layer in the layered architecture provides service to the layers which are directly above and below it. The outgoing information will travel down through the layers to the lowest layer. While moving down on the source machine, it acquires all the control information which is required to reach the destination machine. The control information is in the form of headers and trailers which surrounds the data received from the layer above. This process of adding headers and trailers to the data is called as data encapsulation. The headers and trailers contain control information in the individual fields. it is used to make message packet reach the destination. The headers and trailers form the envelope which carries the message to the desired destination.
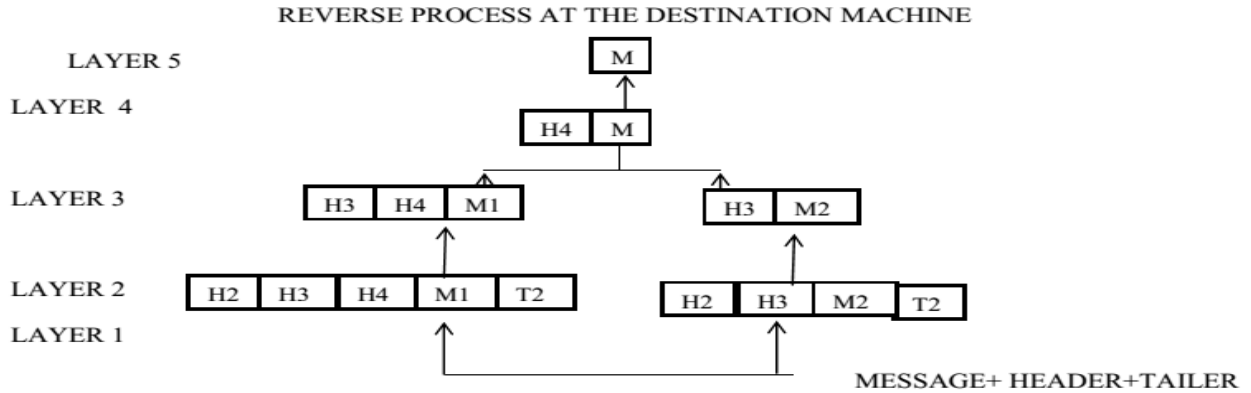
Example:
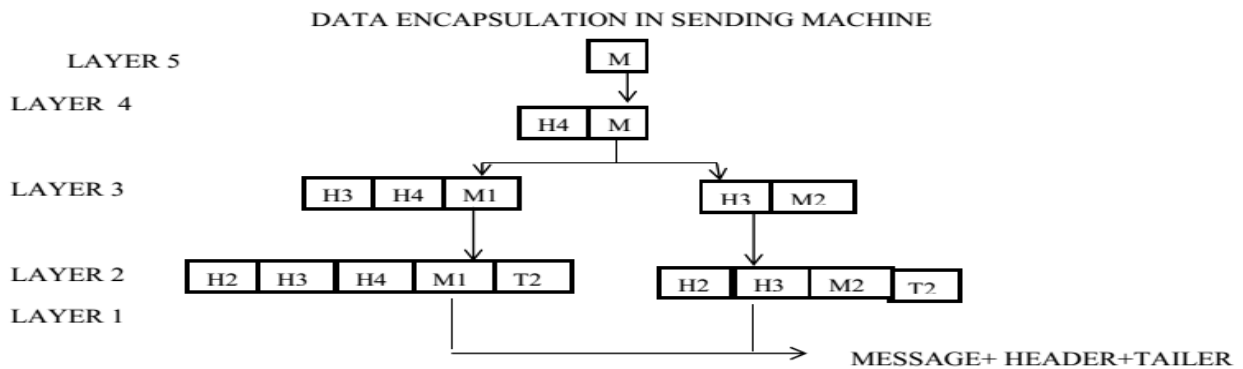
H4 = LAYER 4 HEADER

H3 = LAYER 3 HEADER

H2 = LAYER 2 HEADER

T2 = LAYER 2 TAILER

REVERSE PROCESS AT THE DESTINATION MACHINE

The figure shows the example of five layer stack for data encapsulation. The fifth layer of sending machine wants to send a message M to the fifth layer of destination machine. The message M is produced by layer 5 of machine 1 and given to layer 4 for transmission. Layer 4 adds header H4 in front of the message and pass it to layer 3. Layer 3 breaks up the incoming message into small units as M1 and M2 and pass these packets to layer 2. Layer 2 adds the header as well as footer to each packet obtained from layer 3 and pass it to layer 1 for physical transmission.

3. Write the name of layers that perform the following functions in OSI:
   I. Data Encryption
   II. Error Correction
   III. File Transfer
   IV. Data encoding (1 mark each).

Answer:

1. **Data Encryption**-Presentation Layer
2. **Error Correction**-Data link layer and Transport layer
3. **File Transfer**-Application layer
4. **Data Encoding**-Presentation layer

4. Explain horizontal and vertical communication. (2 M each)

Answer: Horizontal communication
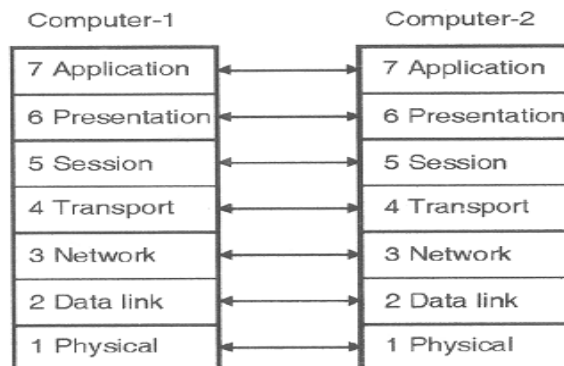
Fig: Horizontal Communication in OSI Model.

1. The horizontal communication is the logical connection between the layers, there is no direct communication between them.
2. Information included in each protocol header by the transmitting system is a message that will be carried to the same protocol in the destination system.
3. For two computers to communicate over a n/w, the protocol used at each layer of the OSI model in the transmitting system must be duplicated at the receiving system.
4. The packet travels up through the protocol stack and each successive header is stripped of by the appropriate protocol & processed.
5. When the packet arrived at its destination, the process by which the headers are applied at the source is repeated in server.

Vertical communication:

1. In addition to communicating horizontally with the same protocol in the other system, the header information also enables each layer to communicate with the layer above & below it.
2. Eg. The n/w layer will communicate with the data link layer & transport layer.
3. This interlayer communication is called communication vertical.
4. When a system receives a packet & passes it up through various layers the data link layer protocol header includes a field which specifies the name of n/w layer protocol to be used to process the packet.
5. The n/w layer protocol header will specify the name of transport layer protocol to be used to process the packet.
6. Due to vertical communication, it becomes protocol at each layer simultaneously.
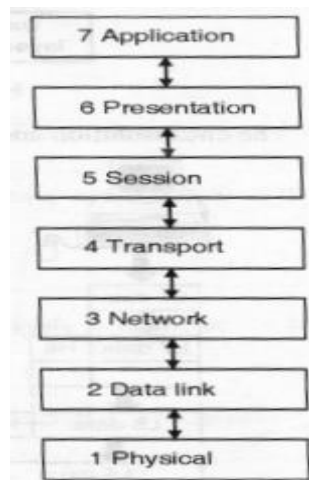

Fig: Vertical communication

6. **List any two components which works at physical layer of OSI model.**
   (Listing of any 2 components – 1 Mark each)
   Ans: Repeater 1) Hub 2) Network Interface card (NIC) 3) Cables 4) Connectors

5.Compare OSI reference model and TCP/IP network Mode. (any 4 points 1 mark for each)

OSI reference model	TCP/IP network model
1)It has 7 layers	1)It has 4 layers
2)Transport layer guarantees delivery of packets	2)Transport layer does not guarantees delivery of packets
3)Horizontal approach	3)Vertical approach
4)Separate presentation layer	4)No session layer, characteristics are provided by transport layer
5)Separate session layer	5)No presentation layer, characteristics are provided by application layer
6)Network layer provides both connectionless and connection oriented services	6)Network layer provides only connection less services
7)It defines the services, interfaces and protocols very clearly and makes a clear distinction between them	7)It does not clearly distinguishes between service interface and protocols
8)The protocol are better hidden and can be easily replaced as the technology changes	8)It is not easy to replace the protocols
9)OSI truly is a general model	9)TCP/IP cannot be used for any other application
10)It has a problem of protocol filtering into a model	10)The model does not fit any protocol stack.

6. Explain the function of each layer of OSI reference model with neat diagram.
(2 marks for diagram, 6 marks for functions of layers)

Answer: OSI model (open system interconnection) model was developed by ISO (international standard organization)

Function of OSI model:

1. It provides way to understand how internetwork operates.
2. ii. It gives guideline for creating network standard. OSI model has 7 layers as shown in the figure.

Application Layer
Presentation Layer
Session Layer
Transport Layer
Network Layer
Data link Layer
Physical Layer

OSI model has following 7 layers as Physical layer, data link layer, Network layer, Transport layer, session layer, presentation layer, application layer.

Physical layer: It co-ordinates the functions required to transmit bit stream over physical medium. It deals with mechanical and electrical specifications of interface and transmission medium. For transmission it defines procedures and functions that devices and transmission medium has to perform

- Physical characteristics of interfaces and media.
- Representation of bits: Data rate (transmission rate).
- Synchronization of bits.
- Line configuration: Point to point or multipoint configuration should be used.

Data link layer: It is responsible for transmitting group of bits between the adjacent nodes. The group of bits is called as frame. The network layer passes a data unit to the data link layer. Header and trailer is added to the data unit by data link layer. This data unit is passed to the physical layer. Data link layer is responsible for moving frames from one node to the next.

Functions of data link layer are:

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Functions of network layer:

1. logical addressing
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4. **Transport layer:** Responsibility of process to process delivery of message Ensure that whole message arrives in order.
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5. **Session layer:** Establishes, maintains, and synchronizes the interaction among communication systems It is responsible for dialog control and synchronization.
Functions of Session layer:

1) Dialog control
2) Synchronization, session and sub session
3) Session closure

6. **Presentation layer:** It is concerned with syntax, semantics of information exchanged between the two systems.
Functions of Presentation layer:

- Translation: presentation layer is responsible for converting various formats into required format of the recipient
- Encryption: Data encryption and decryption is done by presentation layer for security.
- Compression and Decompression: data to be transform compressed while sending and decompress while receiving for reducing time of transmission.

7. **Application layer:** It enables user to access the network. It provides user interfaces and support for services like email, remote file access.
Functions of Application layer:

- Network virtual terminal
- file transfer access and management
- mail services and directory services

Summer-14

1. **Describe horizontal and vertical communication.**
   (Horizontal Comm.-2 Marks, Vertical Comm.- 2 Marks)

Answer: Already Given

2. **What are the services provided by the network layer of OSI model.**
   (*Any 4 Services – 1 Mark each).*

   Ans:

The services provided by the network layer of OSI model as follows

1. To route the signals through various channels to the other end.
2. To act as the network controller by deciding which route data should take.
3. To divide the outgoing messages into packets and to assemble incoming packets into messages for the higher levels.
4. The network layer is responsible for the source-to-destination delivery of a packet, possibly across multiple networks (links)
5. **Logical addressing**: The physical addressing implemented by the data link layer handles the addressing problem locally. If a packet passes the network boundary, we need another addressing system to help distinguish the source and destination systems. The network layer

adds a header to the packet coming from the upper layer that, among other things, includes the logical addresses of the sender and receiver.

3. **Which layer of OSI model packages raw data bit. Describe bit stuffing with one example.** *(Identification of Data link layer - 1 Mark, bit stuffing- 2 Marks, Example- 1 Mark)*

Ans: Data link layer of OSI model packages raw data bit.

Bit stuffing:
Bit stuffing is the process of adding one extra 0 whenever five consecutive 1"s in the data, so that the receiver does not mistake the pattern 0111110 or a flag. At sender side the bit is stuffed and at receiver side stuffed bit is removed. As shown in following
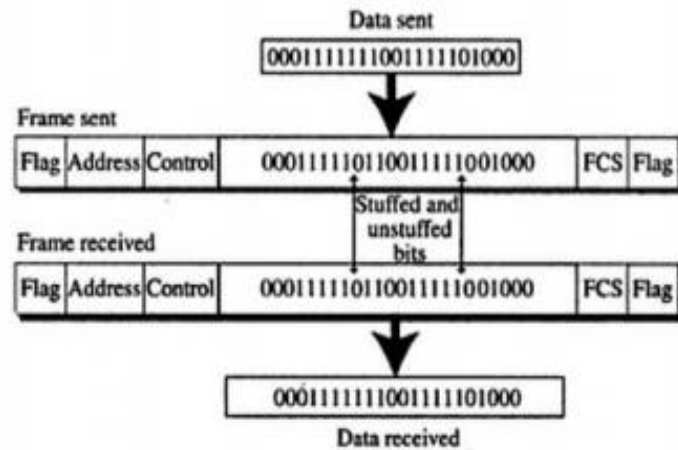
For example

Stuffed Bit
↓

Sequence 011111111000 becomes 0111110111000.

This extra bit is inserted regardless of sixth bit 0 or 1.

4. **Describe OSI model with layer structure.**
   (Diagram - 1 Mark, Explanation - 3 Marks)

Answer : Already Given.

Winter-15

1. **Define the following**
   1) Protocol
   2) Peer
   (Definition - 1Mark each)

Ans:
a) Protocol: - It is set of rules and conventions .Sender and receiver in data communication must agree on common set of rules before they can communicate with each other.

OR

Protocol is a system of digital message formats and rules for exchanging those messages in or between computing systems.
Protocol defines.

        a) Syntax (what is to be communicated)
        b) Semantics (how is it to be communicated
        c) Timing (When it should be communicated)

b) Peer: Peers are computer systems which are connected to each other via the Internet. Files can be shared directly between systems on the network without the need of a central server. In other words, each computer on a Peer to Peer network becomes a file server as well as a client.

> *2.* **Explain horizontal communication and vertical communication.**
> *(Horizontal Comm. - 2 Marks, Vertical Comm. - 2 Marks)*

Answer: Already Given.

> *3.* **Explain the following terms with respect to presentation layer:**
> **(i) Data encryption**
> **(ii) Data compression**
> *(Data Encryption Explanation - 2 Marks & Data Compression Explanations - 2Marks.)*

Ans:

(i)   Data Encryption
    ➢ For ensuring the security and privacy of the information that is being communicated, a process is called data encryption.
    ➢ Data encryption is carried out at the sending signal. In this the sender transforms the original information to another form and sends the transformed information.
    ➢ Data encryption ensures the security of the data as it travels down the protocol stack.
    ➢ For example, one of the most popular encryption schemes that is usually associated with the presentation layer is the Secure Sockets Layer (SSL) protocol. Not all encryption is done at layer however; some encryption is often done at lower layers in the protocol stack, in technologies such as IPSec.

(ii)   Data Compression
    ➢ The data compression technique is used for reducing the number of bits required to send information.
    ➢ Compression improve the throughput of data
    ➢ Data compression is essential for transmission of multimedia such as text, audio, video..

4. **What do you mean by remote access?**
   (Explanation of Remote access - 2 Marks, Advantages - 1 Mark, Disadvantages - 1Mark)

Ans:

Remote access is the ability to get access to a computer or a network from a remote distance. In corporations, people at branch offices, telecommuters, and people who are travelling may need access to the corporation's network. Home users get access to the Internet through remote access to an Internet service provider. Dial-up connection through desktop, notebook, or handheld computer modem over regular telephone lines is a common method of remote access. Remote access is also possible using a dedicated line between a computer or a remote local area network and the "central" or main corporate local area network. A dedicated line is more expensive and less flexible but offers faster data rates. Integrated Services Digital Network is a common method of remote access from branch offices since it combines dial-up with faster data rates.

Advantages:

1. It enables user access to centralized application, stored private or shared files on LAN.
2. User can access their files and emails from remote location.

Disadvantages:

1. Require more security
2. More hardware or complex hardware required.

5. **Draw the adjacent layers in DLL in OSI reference model and describe the major functions and responsibilities of DLL .Describe two sublayers of DLL.** *(Diagram – 2 Marks, Function and responsibility – 2 Marks, Each Sub layer – 2 Marks each).*

Ans:
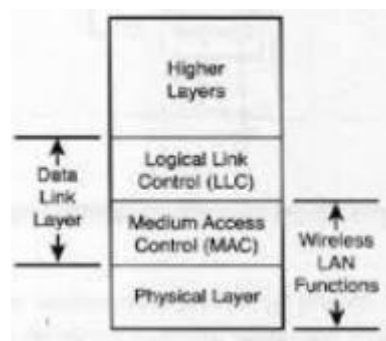
D**ata link layer** is responsible for transmitting group of bits between the adjacent nodes. The group of bits is called as frame. The network layer passes a data unit to the data link layer. Header and trailer is added to the data unit by data link layer. This data unit is passed to the physical layer. Data link layer is responsible for moving frames from one node to the next.

Functions of data link layer are:

1. Link establishment and termination: establishes and terminates the logical link between two nodes.
2. Frame traffic control: tells the transmitting node to "back-off" when no frame buffers are available.
3. Frame sequencing: transmits/receives frames sequentially.
4. Frame acknowledgment: provides/expects frame acknowledgments. Detects and recovers from errors that occur in the physical layer by retransmitting non-acknowledged frames and handling duplicate frame receipt.
5. Frame delimiting: creates and recognizes frame boundaries. Frame error checking: checks received frames for integrity.
6. Media access management: determines when the node "has the right" to use the physical medium.

Sublayers of Data Link layer:
1) Logical link control sub layer:

It performs functions in the upper portion of the Data Link layer, such as flow control and management of connection errors. LLC supports the following three types of connections for transmitting data:

1) Unacknowledged connectionless service: does not perform reliability checks or maintain a connection, very fast, most commonly used

2) Connection oriented service: once the connection is established, blocks of data can be transferred between nodes until one of the node terminates the connection.

3) Acknowledged connectionless service provides a mechanism through which individual frames can be acknowledged.

2) Media Access Control:

This sub layer contains methods that logical topologies can use to regulate the timing of data signals and eliminate collisions. The Media Access Control sub layer also determines where one frame of data ends and the next one starts – frame synchronization. There are four means of frame synchronization: time based, character counting, byte stuffing and bit stuffing.