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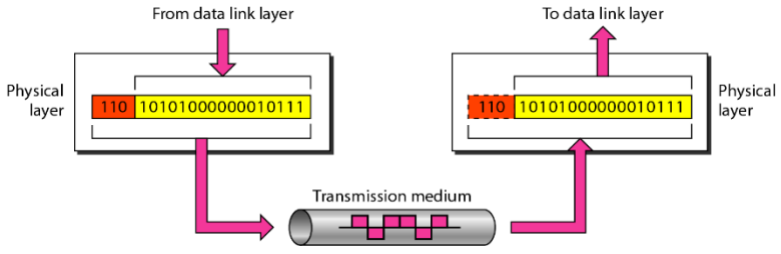
Section B
Subject Networking and communication
Dpt BSSE

Question 1(a):

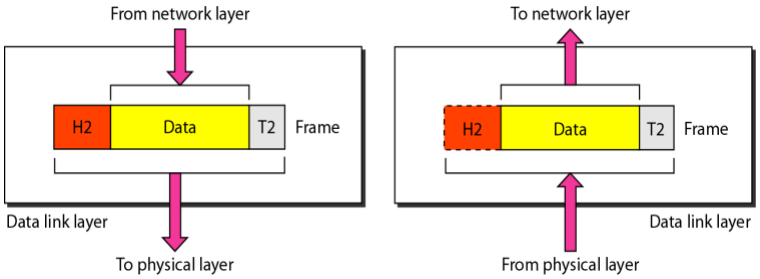
Answer: The OSI model: The OSI model is a conceptual framework used to describe the function of networking system. The OSI model characterizes computing functions into universal set of rules and requirements in order to support interoper _ ability between different products and software. In the OSI reference model the communication between a computing system are split into seven different abstraction layers. Create at a time when network computing was in its infancy the OSI was published in 1984 by the international can organization for standardization ISO. Though it does not always map directly to specific system the OSI model is still used today as a means to describe network architecture.

Physical Layer: The lowest layer of the OSI model is concerned with electrically or optically transmitting raw unstructured data bit across the network from the physical layer of the receiving device. It can include specification such as voltages, pin layout, cable and ratio frequencies. The physical layer is also concerned with the following; Physical characteristic of interface and medium.
The physical layer defines the characteristic of interface between the device and the transmission medium. It also defines the type of transmission medium.
Representation of bits. The physical layer data consists of a stream of bits with no interpretation. To be transmitted bits.

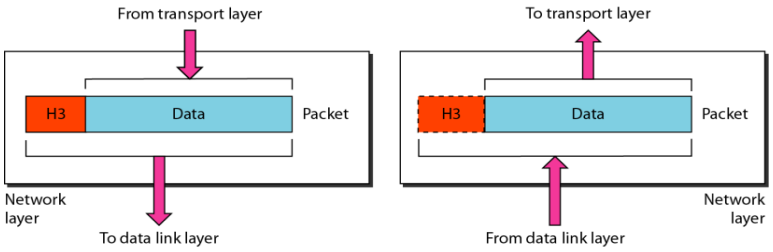


Data Link Layer: The data link layer deals with device addresses called media access control (MA**C)** addresses which are burned in to the device at the time of manufacture

its also deals with the movement of data from one device to another devices within the same network. The data link layer is often referred to as layer 2. The most common PDU at layer 2 in a local area network (LAN) is the frame. LAN switches are said to operate at layer 2 because they build tables of Ethernet MAC addresses and use the source and destination MAC addresses in each frame to decide which switch port should be used to send the data toward its Destination when you hear layer 2 think in term of Ethernet.

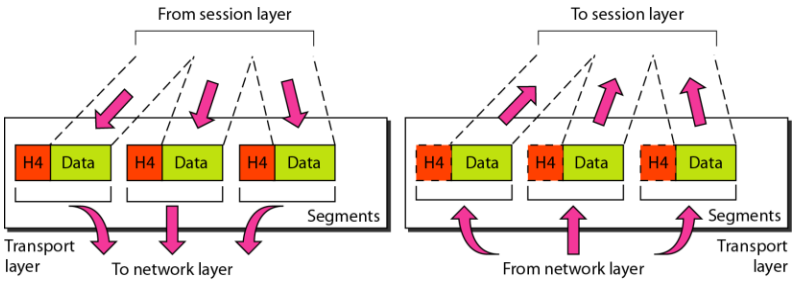


The Network Layer: Where the data link layer is concerned with moving data within a network the network layer is concerned with moving data from one network to another and determining the best path to get to a distinct network. The network layer is often referred to as layer 3 and PDU at layer 3 is the internet protocol (IP). IP addresses are logical assigned either manually by the network administration or automatically via one of several dynamic address schemes. An IP address is a 32-bit binary. A typical IP address looks like this; 172.16.180.12. Network routers operate at layer 3.



The Transport Layer: The transport layer is concern with providing a set services used by application at higher layers to set up sessions between applications running on one PC with applications running on another. If you have ever marveled at the fact. Application can request two different types of connection from the transport layer. The transport layer can provide either connection oriented communication In the case of connection oriented communication the layer4 PDU is the segment. The most common CO (TCP) and the and most common connectionless protocol. The primary deciding factor between using TCP and UDP is Error

recovery v speed. When in fact it is two separate protocols that are often used together.



Question 1(b):

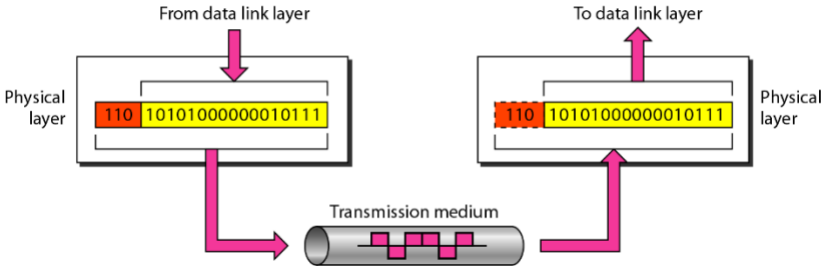
Answer: Advantages: Single Layer to study as all the functionalities is provided at this layer.
High Bandwidth as number of layer is reduced.
It reflects the real-life separation of application from the TCP-downward sections of the OSI model.
It can used to established a connection between two PC.

Disadvantages: Can make reasoning about the architecture of network systems less effective.
There will be security issues as the network security and application security will open at a single point which may exposed our network open to our threat.
It makes troubleshooting hard as multiple errors may reside at a single layer.
You can use it as reference model.

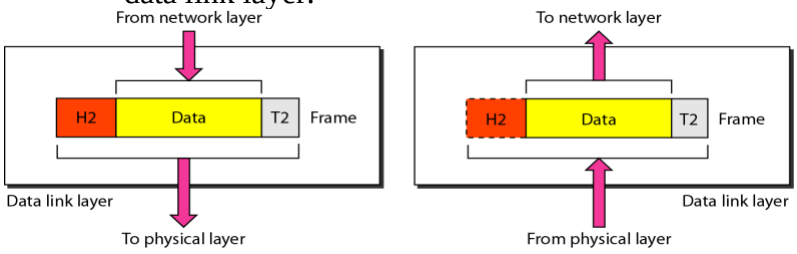
Question 2(a):

Answer: Physical Layer: The physical layer coordinates the function required to carry a bit stream over a physical medium. It deal with the mechanical and electrical specification of the inter face and transmission medium. It also defined the procedure and functions that physical devices and interfaces have to perform for transmission to occur.
Physical characteristics of interface and medium. The physic Layer defines the characteristic of the interface between the device and the transmission of bits the physical layer data consists of a stream of bits sequence of 0s and 1s with no interpretation. To be transmitted bits must be ended into signals.
Line configuration. The physical layer is concern with the connection of devices to the media. In point to point configuration two devices are connected through a dedicated

link. In a multipoint configuration a link is shared among several devices.
Transmission mode the physical layer also defined the direction of transmission between two devices Simplex and half duplex or full duplex. In simplex mode only one can send data the other only can received.
In half duplex two device can send and received. But not at the same time.
In full duplex two devices can send and received at the same time.

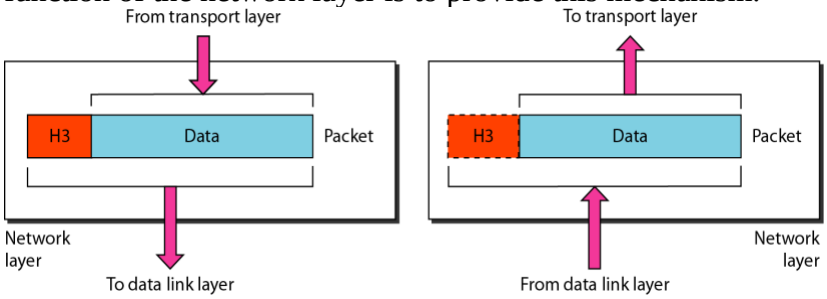


Data Link Layer: The data link layer transforms the physic al layer, a raw transmission facility to a reliable link. It makes the physical layer free from errors to the upper layer.
Framing the data link layer divides the stream of bits receive from the network layer into manageable data units called frame.
Error control for data link layer add reliability to the physical layer by adding mechanism to detect and retransmit damaged or lost frames.
Access control when two or more devices are connected to the same link data link layer protocols are necessary to determined which device has control over the link at my give time. Illustrates hop to hop (node to node) delivery to the data link layer.



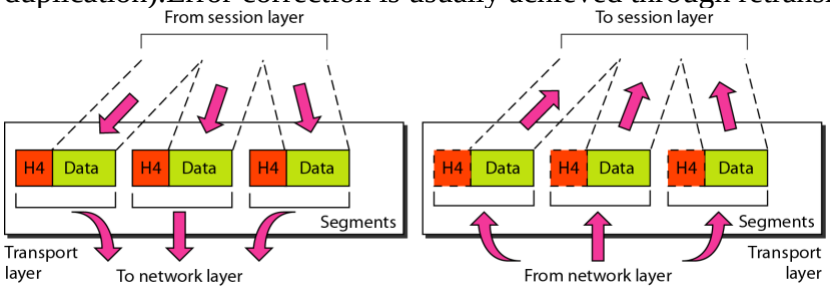
Network Layer: The network layer is responsible for the source to destination delivery of a packet, possibly across multiple network (links).Whereas the data link layer oversees the delivery of the packet between two systems on the same network (links), the network layers ensures that each packets gets from its point of origin to its final destination.

If two systems are connected to the same link, there is usually no need for a network layer. However, if the two system are attached to the different networks(links) with layer to accomplish source to destination.
Other responsibilities of the network layer include the following:
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.
routing.
When independent networks or links are connected to create internet works (network of networks) or a large network< the connecting devices (called routers or switches) route or switch the packets to their final destination. One of the function of the network layer is to provide this mechanism.



Transport Layer:
The transport layer is responsible for process to process delivery of the entire massage process is an application program running on a host. Whereas the network layer oversees source to destination delivery of individual packets, it does not recognize any relationship between those packets. It treats each one independently, as though each pieces belonged to a separate massage, whether or not it does. The transport layer, on the other hand, ensures that the whole massage arrives intact and in order, overseeing both error control and flow control at the source to destination level.
Other responsibilities of the transport layer include the following.
Service point addressing.
Computers often run several programs at the same time. For this reason, source to destination delivery mean delivery not only from one computer to the next but also from a specific process(running program) on one computer to a specific process(running program) to the other. The transport layer header must therefore include a type of address called a service point address (or address).The network layer get each packet to the correct computer; the transport layer gets the entire message to the correct process on that computer.
Error control
Like the data link layer, the transport layer is responsible for error control. However, error control at this layer is performed process to process rather than across a single link. The sending transport layer makes sure that the entire message

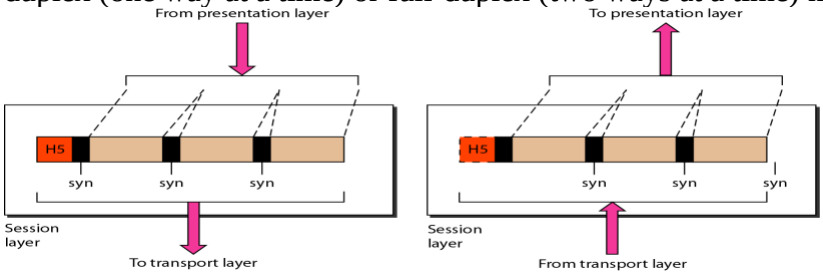
arrives at the receiving transport layer without error(damage, loss or duplication).Error correction is usually achieved through retransmission.



Session Layer:

The services provided by the first three layers (physical, data link, and network) are not sufficient for some processes. The session layer is the network dialog controller. It establishes, maintains, and synchronizes the interaction among communicating systems.

Dialog control. The session layer allows two systems to enter into a dialog. It allows the communication between two processes to take place in either half duplex (one way at a time) or full-duplex (two ways at a time) mode.

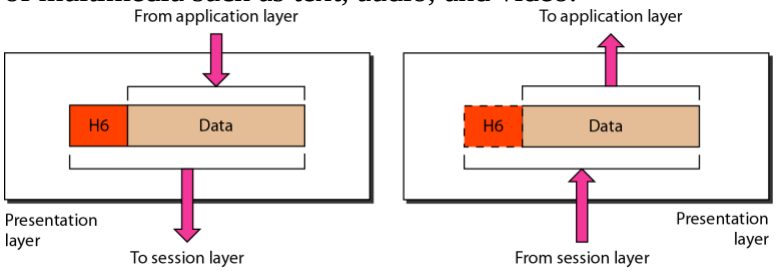


Presentation Layer:

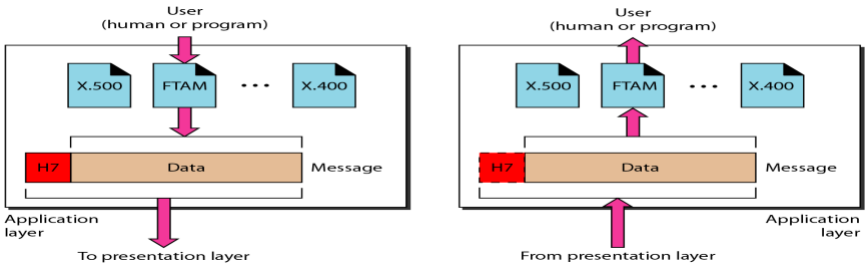
The presentation layer is concerned with the syntax and semantics of the information exchanged between two systems. Shows the relationship between the presentation layer and the application and session layers.

Encryption. To carry sensitive information, a system must be able to ensure privacy. Encryption means that the sender transforms the original information to another form and sends the resulting message out over the network. Decryption reverses the original process to transform the message back to its original form.

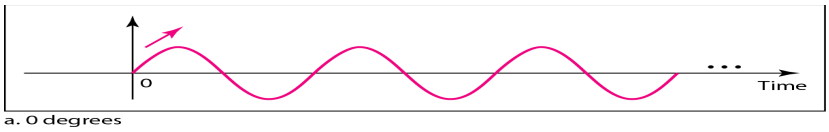
Compression Data compression reduces the number of bits contained in the information. Data compression becomes particularly important in the transmission of multimedia such as text, audio, and video.



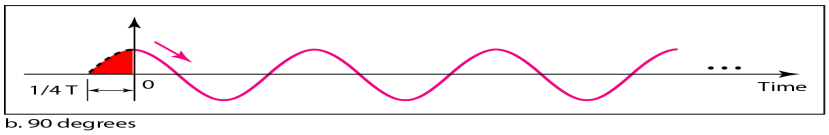
Application Layer:
The application layer enables the user, whether human or software, to access the network. It provides user interfaces and support for services such as electronic mail, remote file access and transfer, shared database management, and other types of distributed information services. Shows the relationship of the application layer to the user and the presentation layer. Of the many application services available, the figure shows only three: XAOO (message-handling services), X.500 (directory services), and file transfer, access, and management (FTAM). The user in this example employs XAOO to send an e-mail message.
File transfer, access, and management. This application allows a user to access files in a remote host (to make changes or read data), to retrieve files from a remote computer for use in the local computer, and to manage or control files in a remote computer locally. Mail services. This application provides the basis for e-mail forwarding and storage. Directory services. This application provides distributed database sources and access for global information about various objects and services.



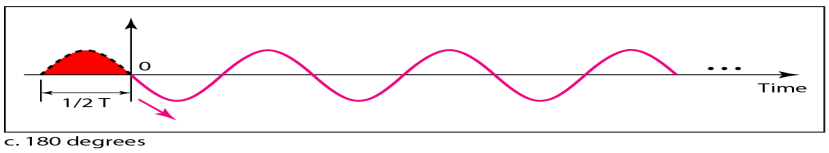
Question 2(b):
Answer: What if a signal does not change at all? What I fit maintains a constant voltage level for the entire time it is active? In such a case, its frequency is zero. Conceptually, this idea is a simple one. If a signal does not change at all, it never completes a cycle, so its frequency is a Hz. But what if a signal changes instantaneously? What if it jumps from one level to another in no time? Then its frequency is infinite. In other words, when a signal changes instantaneously, its period is zero; since frequency is the inverse of period in this case, the frequency is 1/0, or infinite
If a signal does not change at all, its frequency is zero. If a signal changes instantaneously, its frequency is infinite.



a. 0 degrees



b. 90 degrees



c. 180 degrees

Question 3(a):

Answer: The duration of 1 bit before multiplexing:
The duration of 1 bit as for 10kbps as follow:
Unit bit/individual connection=multiplexing
1/10kbps=0.0001s
1/10000bps=1ms
The duration of 1 bit for connection 100kbps as:
1bit/100kbps=0.000015

The duration of 1 bit for connection 1mbps as:
1 bit/1mbps=1us

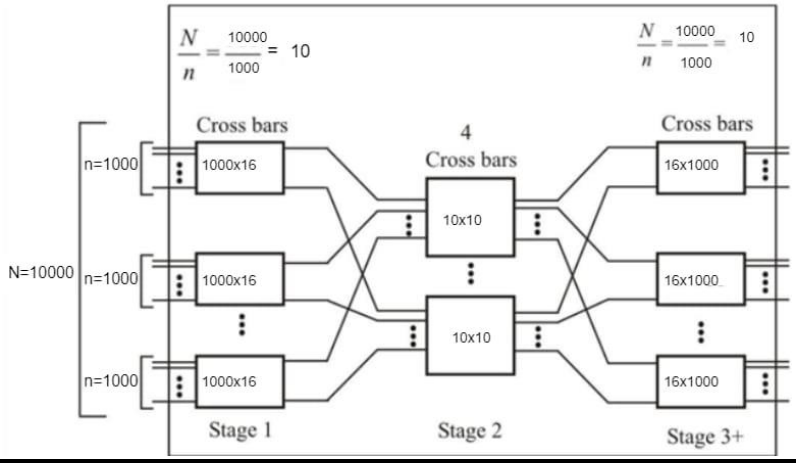
The duration of 1 bit for connection 10mbps as:
1bit/10mbps
1bit/10*10”6bps=10*4.5

(b)The transmission table of link:
The rate of link is 4 times
The rate of a connection 4kbps.

(c)The duration of a time slot as:
The duration of each time slot is one-fourth of the duration of each bit before multiplexing or 1/4ms from data rate of the link 4kbps. The bit duration the inverse of the data rate.

(d)The duration of a frame:
The duration of a frame is always the same as the duration of a unit before multiplexing or 1ms. We can also calculate this in another ways. Each frame in this case has four time slots so duration of a frame is 4 times or 1ms

Question 3(b):



Answer:

(b)The number of cross point=1000(1000*16) +16(1000*1000) +1000(16*1000)=48000000

(c)Only four simultaneous connection are possible for each crossbar at the first stage. This means that the total number of simultaneous is 16*1000=16000.

(d)If we use one single crossbar (1000*1000) all the input lines can have a connection at the Same time which means 1000 simultaneous connection.

(e)The blocking factors 1600/1000 or 1600%.