

1. a) **What is network? Write the different kinds of networks and briefly explain them.** 5

Ans:

A network, in computing, is a group of two or more devices that can communicate. In practice, a network is comprised of a number of different computer systems connected by physical and or wireless connections.

A computer network is mainly of four types:

1.**LAN**: LAN stands for Local Area Network. Local Area Network is a group of computers connected to each other in a small area such as building, office.

2.**PAN**: PAN stands for Personal Area Network. Personal Area Network is a network arranged within an individual person, typically within a range of 10 meters.

3.**MAN**: MAN stands for Metropolitan Area Network. A metropolitan area network is a network that covers a larger geographic area by interconnecting a different LAN to form a larger network.

4.**WAN**: WAN stands for Wide Area Network. A Wide Area Network is a network that extends over a large geographical area such as states or countries.

- b) **Describe the application of 7 layers of OSI model.** 5

Ans:

**Physical Layer** :The physical layer helps you to define the electrical and physical specifications of the data connection.Examples of hardware in the physical layer are network adapters, ethernet, repeaters, networking hubs, etc.

**Data Link Layer**: Data link layer corrects errors which can occur at the physical layer. The layer allows you to define the protocol to establish and terminates a connection between two connected network devices.

**Transport Layer**: The transport layer builds on the network layer to provide data transport from a process on a source machine to a process on a destination machine. It is hosted using single or multiple networks, and also maintains the quality of service functions.

**Network Layer**: The network layer provides the functional and procedural means of transferring variable length data sequences from one node to another connected in "different networks".

Message delivery at the network layer does not give any guaranteed to be reliable network layer protocol.

**Session Layer:** Session Layer controls the dialogues between computers. It helps you to establish starting and terminating the connections between the local and remote application. It also allows a process to add a checkpoint to stream of data.

**Presentation Layer:** Presentation layer allows you to define the form in which the data is to exchange between the two communicating entities. It also helps you to handles data compression and data encryption. It provides a user interface and support for services like email and file transfer.

**Application Layer:** Application layer interacts with an application program, which is the highest level of OSI model. The application layer is the OSI layer, which is closest to the end-user. It means OSI application layer allows users to interact with other software application.

c) **Mention some benefits of data communication.**

4

Ans: Data communication is the process in which data is transferred from one place to another using computing and communication technology. In data communication, the transmission of data occurs over a point-to-point or a point-to-multipoint communication channel. An wireless communication channel is one of the examples of such channels.

Some benefits of Data Communication are :

1. safe and stable data exchange environment
2. joint information protection system
3. data transmission in compliance with the IP data transmission protocol
4. quick network connection of new branches and partners.
5. network monitoring and services quality control 24-hours a day.

2. a) **Difference between a port address, a logical address and a physical address.**

5

Ans:

Through logical address the system identify a network (source to destination). after identifying the network physical address is used to identify the host on that network. The port address is used to identify the particular application running on the destination machine.

**Logical Address:** An IP address of the system is called logical address. This address is the combination of Net ID and Host ID. This address is used by network layer to identify a particular network (source to destination) among the networks. This address can be changed by changing the host position on the network. So it is called logical address.

**Physical address:** Each system having a NIC through which two systems physically connected with each other with cables. The address of the NIC is called Physical address or mac address. This is specified by the manufacture company of the card. This address is used by data link layer.

**Port Address:** There are many application running on the computer. Each application run with a port no.(logically) on the computer. This port no. for application is decided by the Kernal of the OS. This port no. is called port address.

b) **Compare the OSI and TCP/IP protocol model.**

4

Ans

### **Characteristics of the OSI Model:**

Here are some important characteristics of the OSI model:

- 1.A layer should only be created where the definite levels of abstraction are needed.
- 2.The function of each layer should be selected as per the internationally standardized protocols.
- 3.The number of layers should be large so that separate functions should not be put in the same layer. At the same time, it should be small enough so that architecture doesn't become very complicated.

### **Characteristics TCP/IP Model:**

Here are the essential characteristics of the TCP/IP protocol:

- 1.Support for a flexible architecture
- 2.Adding more systems to a network is easy.
- 3.In TCP/IP, the network remains intact until the source and destination machines were functioning properly.
- 4.TCP is a connection-oriented protocol.

c) **With example describe the levels of addresses are used in an internet employing the TCP/IP protocols.** 5

Ans:

Four levels of addresses are used in the TCP/IP protocol: physical address, logical address, port address, and application-specific address .

**Physical Addresses** :The physical address, also known as the link address, is the address of a node as defined by its LAN or WAN.The size and format of these addresses vary depending on the network. For example, Ethernet uses a 6-byte (48-bit) physical address.

**Logical Addresses** : Logical addresses are used by networking software to allow packets to be independent of the physical connection of the network, that is, to work with different network topologies and types of media.

**Port Addresses** :There are many application running on the computer. Each application run with a port no.(logically) on the computer.A port number is part of the addressing information used to identify the senders and receivers of messages.

**Application-Specific Addresses**: Some applications have user-friendly addresses that are designed for that specific application.

3. a) **What is cryptography? Write the different types of cryptography.**

6

Ans:

Cryptography is associated with the process of converting ordinary plain text into unintelligible text and vice-versa. It is a method of storing and transmitting data in a particular form so that only those for whom it is intended can read and process it.

In general there are three types Of cryptography:

**1. Symmetric Key Cryptography:** It is an encryption system where the sender and receiver of message use a single common key to encrypt and decrypt messages. Symmetric Key Systems are faster and simpler but the problem is that sender and receiver have to somehow exchange key in a secure manner.

**2. Hash Functions:** There is no usage of any key in this algorithm. A hash value with fixed length is calculated as per the plain text which makes it impossible for contents of plain text to be recovered. Many operating systems use hash functions to encrypt passwords.

**3. Asymmetric Key Cryptography:** Under this system a pair of keys is used to encrypt and decrypt information. A public key is used for encryption and a private key is used for decryption. Public key and Private Key are different. Even if the public key is known by everyone the intended receiver can only decode it because he alone knows the private key.

- b) **Why TCP is called connection-oriented reliable protocol? Describe the header fields of TCP segment format.**

3+5

Ans:

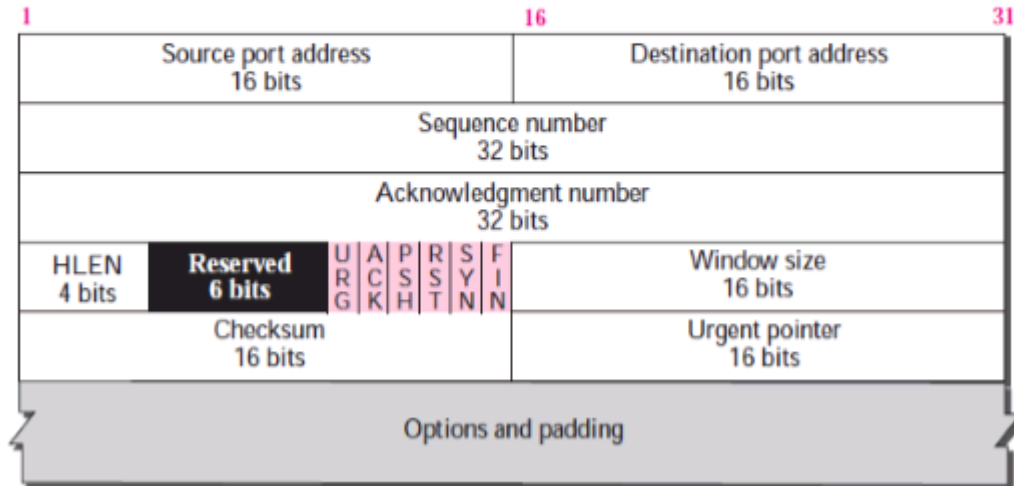
Transmission Control Protocol is a connection-oriented protocol. For connection-oriented communications, each end point must be able to transmit so that it can communicate. Because they can keep track of a conversation, connection-oriented protocols are sometimes described as stateful. Transmission Control Protocol Applications that require the transport protocol to provide reliable data delivery use TCP because it verifies that data is delivered across the network accurately and in the proper sequence. TCP is a reliable, connection-oriented, byte-stream protocol.

The segment consists of a header of 20 to 60 bytes, followed by data from the application program.

The header is 20 bytes.



a. Segment



i. Source port address: This is a 16-bit field that defines the port number of the application program in the host that is sending the segment. This serves the same purpose as the source port address in the UDP header.

ii. Destination port address: This is a 16-bit field that defines the port number of the application program in the host that is receiving the segment. This serves the same purpose as the destination port address in the UDP header.

iii. Sequence number: This 32-bit field defines the number assigned to the first byte of data contained in this segment. TCP is a stream transport protocol. To ensure connectivity, each byte to be transmitted is numbered. The sequence number tells the destination which byte in this sequence is the first byte in the segment. During connection establishment each party uses a random number generator to create an initial sequence number (ISN), which is usually different in each direction.

4. a) **Why do we need a DNS system when we can directly use an IP address?**

4

Ans:

DNS is an alphanumeric term and IP is a number. We like to understand this IP-number better by a name. In the structured name we have also direct regional information about the owner

For several reasons we need a DNS system when we can directly use an IP address:

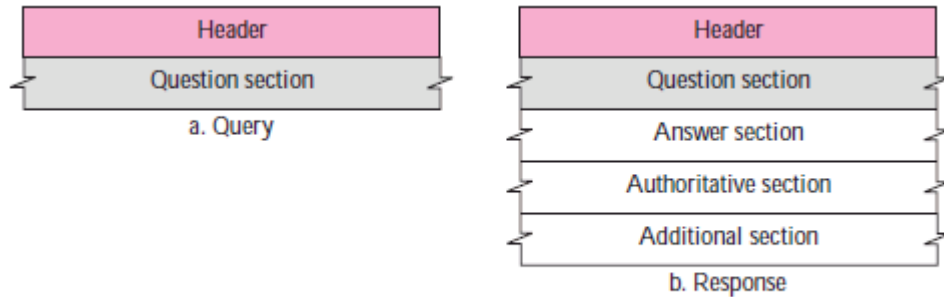
1. It is much easier to remember addresses than IPS (in IP v4 - 12 numbers)
2. The IP address can change without affecting the customers. For example: I can change a server from my university to a commercial provider and the customers can access the website by its name (the same as before, while the IP would change).
3. DNSs are also a sort of catalogue, most of the registered names are there because they need to be accessed, while many devices have IP but do not need to be accessed by the general public and thus do not require a name.

b) What are the two main categories of DNS message?

4

Ans:

DNS has two types of messages: query and response. Both types have the same format. The query message consists of a header and question records; the response message consists of a header, question records, answer records, authoritative records, and additional records.



**Fig4: Query and response messages**

c) Write short note on:

6

- 1.TELNET
- 2.DNS
- 3.POP3

Ans

1.**TELNET**: Telnet is one of the earliest remote login protocols on the Internet. It was initially released in the early days of IP networking in 1969, and was for a long time the default way to access remote networked computers. It is a client-server protocol that provides the user a terminal session to the remote host from the telnet client application.

2.**DNS** :Domain Name Servers (DNS) are the Internet's equivalent of a phone book. They maintain a directory of domain names and translate them to Internet Protocol (IP) addresses. This is necessary because, although domain names are easy for people to remember, computers or machines, access websites based on IP addresses.

3. **POP3** : It is a simple protocol used for opening the remote e-mail boxes. This protocol is defined in RFC 1225. Post Office Protocol version 3 (POP3) is a message access protocol that enables the client to fetch an e-mail from the remote mail server. A POP3 server stores messages for each user until the user connects to download and read them using a POP3 client such as Microsoft Outlook 98, Microsoft Outlook Express, or Microsoft Mail and News.

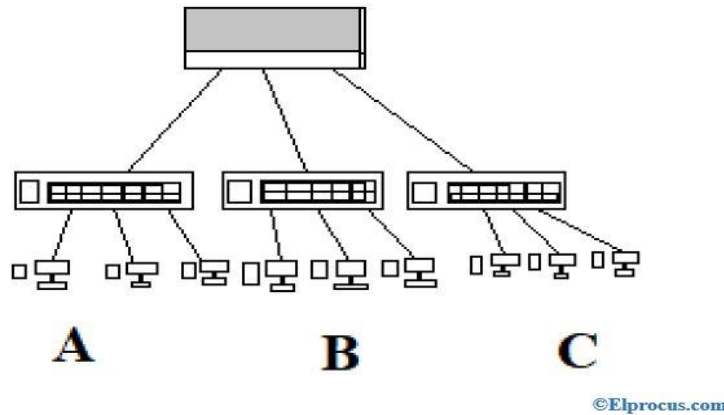
5. a) What is Virtual LAN? Explain Virtual LAN with figure.

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Ans:

Virtual LAN: VLAN is a virtual area network that allows us to create multiple LAN networks, with the help of a single switch and also allows us to communicate between different VLAN-virtual local area network without using any physical intermediate device like a router. The main purpose of VLAN is that it can reduce congestion. For better understanding let us consider an example of a LAN and VLAN. LAN architecture can be understood by the following example, in an organization let us assume there are 3 groups, group1, group2, group3, if we don't want anyone of the group to communicate with other groups then we use three separate switches and for intercommunication between three groups, we use an additional networking device

router, which is known as the LAN. Where the maintenance cost and time consumption increases.



b) **Describe Ring , Star and Bus network topology with their advantages.**

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Ans:

**Ring topology:** It is called ring topology because it forms a ring as each computer is connected to another computer, with the last one connected to the first. Exactly two neighbours for each device.

Advantages:

1. Transmitting network is not affected by high traffic or by adding more nodes, as only the nodes having tokens can transmit data.
2. Cheap to install and expand.

**Star topology:** In this type of topology all the computers are connected to a single hub through a cable. This hub is the central node and all other nodes are connected to the central node.

Advantages:

1. Fast performance with few nodes and low network traffic.
2. Hub can be upgraded easily.
3. Easy to troubleshoot.

**Bus topology:** Bus topology is a network type in which every computer and network device is connected to single cable. When it has exactly two endpoints, then it is called Linear Bus topology.

Advantages:

1. Advantages It is cost effective.
2. Cable required is least compared to other network topology.
3. Used in small networks.

c) **What is digital signature? Comparison between conventional and digital signature.**

5

Ans:

A digital signature guarantees the authenticity of an electronic document or message in digital communication and uses encryption techniques to provide proof of original and unmodified documentation.

**Digital Signature :** The Digital Signature is a type of electronic signature and follows the particular standards. It imparts independent verification and tamper evidence. The verification of digital signatures is done by the trusted third party commonly referred to a Certificate Authority. When





This large address space allow a better, systematic, hierarchical allocation of addresses and efficient route aggregation.

**3. Multicast:** The three types of communication available in in IPv4 are unicast,multicast and broadcast. Unicast is one-to-one communication; multicast is one-to-many communication and broadcast is one-to-all communication.

**4. Jumbograms:** Jumbograms is an optional feature of IPv6. Jumbograms allow packets with payloads  $2^{32} - 1$  (4,294,967,295) bytes by making use of a 32-bit length field.

c) **Describe mapping host name into IP address with figure.**

4

Ans:

While using the Domain Name System (DNS) is an easier and more scalable way to resolve IP addresses from hostnames, you might want to manually map the hostname to a static IP address for the following reasons:

- You might not have a DNS entry for the device.
- You might not want the computer to contact the DNS server to resolve a particular IP address—you might use this particular IP address frequently, or it might be just for testing or development purposes.

To map a device's hostname to one or more IP addresses:

1. Include the inet statement at the [edit system static-host-mapping *hostname*] hierarchy level.
2. Verify the configuration with the show command.

7. a) **What is SNMP? Describe the function of network management system.**

5

Ans:

Simple Network Management Protocol is an Internet Standard protocol for collecting and organizing information about managed devices on IP networks and for modifying that information to change device behavior.

**function of network management system:**

Network configuration is necessary to allow computers in a network to communicate with each other. Configuration exists to control networks and allow troubleshooting or performance enhancements. There are many devices used in a network. The most important medium are routers and switches. When configured correctly, it will allow them to communicate which then allows users to communicate with each other. Fault management is compulsory in any network as it will detect problems and minimize failure. In case of failure, it will be prepared to troubleshoot the issues as quick as possible. By monitoring the networks, you can see if an error occurs it will ensure that the network is up for as long as possible. Fault management could be approached from a remotely controlled centralized console, which will allow you to easily reboot or troubleshoot one or more computer. Account management involves taking care of the users' account and ensuring they can access all software easily.

b) **List out the port number:**

4

1. SMTP
2. FTP
3. HTTP
4. TELNET

Ans:

1. SMTP: Ports 25, 465, 587, or 2525 for SMTP have all been considered standard SMTP ports at some point, but only 587 or 2525 really should be considered for modern use. If you're configuring your systems to use SparkPost as an SMTP relay, you should use port 587 as your standard SMTP port, with 2525 as an alternate in case port 587 is not available.

2. FTP: FTP is an unusual service in that it utilizes two ports, a 'data' port and a 'command' port (also known as the control port). Traditionally these are port 21 for the command port and port 20 for the data port.

3. HTTP: HTTP port number 80. In computer network, a port is an endpoint of communication. Physical as well as wireless connections are terminated at ports of hardware devices. At the software level, within an operating system, a port is a logical construct that identifies a specific process or a type of network service.

4. TELNET: The end point of a logical connection is known as port. Port number is logical address of each application or process or program which uses network or internet connection in order to communicate. The port numbers from 0 to 1024 are known as well known ports and are used for specialized services or privileged services. TELNET port number is 23.

c) **Mention the differences between TCP and UDP.**

5

Ans:

TCP	UDP
1. It is a connection-oriented protocol	1. It is a connectionless protocol.
2. TCP rearranges data packets in the specific order.	2. UDP protocol has no fixed order because all packets are independent of each other
3. The speed for TCP is slower.	3. UDP is faster as error recovery is not attempted.
4. Header size is 20 bytes	4. Header size is 8 bytes
5. TCP does error checking and also makes error recovery.	5. UDP performs error checking, but it discards erroneous packets.

8. a) **Why HTTP used? Mention the request type of HTTP with action.**

5

Ans:

Due to its extensibility, it is used to not only fetch hypertext documents, but also images and videos or to post content to servers, like with HTML form results. HTTP can also be used to fetch parts of documents to update Web pages on demand.

**The request type of HTTP with action:**

**1.GET:** The GET method is used to retrieve information from the given server using a given URI. Requests using GET should only retrieve data and should have no other effect on the data.

**2. HEAD:** Same as GET, but transfers the status line and header section only.

**3. POST:** A POST request is used to send data to the server, for example, customer information, file upload, etc. using HTML forms.

**4.PUT:** Replaces all current representations of the target resource with the uploaded content.

**5.DELETE:** Removes all current representations of the target resource given by a URI

b) **What is sub-netting? Write down the purpose of sub-netting.**

5

Ans:

**Subnetting** :Sub-netting is the strategy used to partition a single physical network into more than one smaller logical sub-networks (subnets). An IP address includes a network segment and a host segment.

five subnetting benefits you should consider:

**1.Improve network performance and speed** :A single broadcast packet sends out information that reaches every device connected to that network because each device has an entry point into the network. A large number of entry points, however, can negatively impact internetwork switching device performance, as well as your network's overall performance.

**2. Reduce network congestion** :Subnetting ensures that traffic destined for a device within a subnet stays in that subnet, which reduces congestion. Through strategic placement of subnets, you can help reduce your network's load and more efficiently route traffic.

**3. Boost network security** :What if a device in my network is comprised By splitting network into subnets, control the flow of traffic using ACLs, QoS, or route-maps, enabling you to identify threats, close points of entry, and target your responses more easily.

**4. Control network growth** :When you're planning and designing a network, size is something that needs to be taken into consideration. One of the key benefits of subnetting is that it enables you to control the growth of your network.

c) **What are the three domains of the domain name space?**

4

Ans:

Host names are divided into several pieces called domains. Domains are designed in a hierarchical structure. The top-level domains refer to the type of organization to which the network belongs, and subdomains further identify the specific network on which the host is situated.

There are four domain names:

1. abc.com
2. abc.net
3. xyz.com
4. pqr.org

In these domain names, there are only seven domains involved. These seven domains are listed here:

1. abc
2. abc
3. xyz
4. pqr
5. com

6. net

7. org