Sabikun Nahar Piya

IT-18020

1. a) What is data communication & Computer Network?

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b) Write the process for communication in client - server model

c) Write the advantages and disadvantages of client server network.

7. a) What is network service? What are the types of network services?

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8. a) What is Application service? How does it work?

b) Write the difference between LAN, MAN and WAN

c) Write the importance of computer networking.

Ques 1. a) What is data communication & Computer network?

Ans: Data communication refers to the transmission of this digital data between two or more computers and a computer network or data network is a telecommunication network that allows computers to exchange data. The physical connection between networked computing devices is established using either cable media or wireless media. The best known computer network is the internet.

A system of interconnected computers and computerized Peripherals such as printers is called computer network. This interconnection among computers facilates information sharing among them. Computers may connect to each other by either word or wireless media.

b) What are the classifications of computer network? Write the applications of computer network.

Ans: classification of computer network:

Computer networks are classified based on various factors. They includes:

1) Geographical span
2) Inter-connectivity
3) Administration
4) Architecture

Applications of computer network:

1) Resource sharing such as printers and storage devices.
2) Exchange of information by means of E-mails and FTP
3) Information sharing by using Web or Internet

4) Interaction with other users using dynamic web pages

5) IP phones

6) Video conferences

7) Parallel computing

8) Instant messaging

9) Why we need data communication & computer network?

Ans: We need to learn data communication and computer network because of these reasons.

Network basic understanding: A system of interconnected computers and computerized peripherals such as printers is called computer network. This interconnection among computers facilates information sharing among them. Computers may connect to each other by either wired or wireless media.

Network Engineering : Network engineering is a complicated task, which involves software, firmware, chip level engineering, hardware and electric pulses. To ease network engineering, the whole networking concept is divided into multiple layers. Each layer is involved in some particular task and is independent of all other layers. But as a whole, almost all networking tasks depend on all of these layers. Layers share data between them and they depend on each other only to take input and send output.

Internet : A network of networks is called an internetwork or simply the internet. It is the largest network in existence on this planet. The internet hugely connects all WANs and it can have connection to LANs and Home networks.

Ques 2. a) Describe the types of computer network.

Ans: There are 4 different types of computer network.

1. Personal Area Network: A personal Area Network (PAN) is smallest network which is very personal to a user. This may include Bluetooth enabled devices or infra-red enabled devices. PAN has connectivity range up to 10 meters. PAN may include wireless computer keyboard and mouse, wireless printers etc.

2. Local Area Network: A computer network spanned inside a building and operated under singe administrative system is generally termed as Local Area Network (LAN). Usually LAN covers an organization offices, colleges or universities. Number of systems connected in LAN

may vary from at least as two to as much as 16 milion

3. Metropolitan Area Network: The Metropolitan Area Network (MAN) generally expands throughout a city such as cable TV network. It can be in the form of Ethernet, Token-ring, ATM or Fibre distributed data Interface (FDDI) Metro Ethernet is a service which is provided by ISPs. This service enables its users to expand their Local Area Network. For example, MAN can help an organization to connect all of its offices in a city.

Wide Area Network: Wide Area Network (WAN) covers a wide area which may span across provinces and even a whole country. Telecommunication networks are Wide Area Network. These networks provide connectivity to MANs and LANs. Since they are equipped with very high speed backbone, WANs use very expensive network equipment.

b) What are the aspects of internet on our life?

Ans: A network of networks is called an Internet. It is the largest network in existence on this planet. The internet hugely connects all WANs and it can have connection to LANs and Home networks. Internet uses TCP/IP protocol suite and uses IP as its addressing protocol. Present day, Internet is widely implemented using IPv4. Because of shortage of address spaces, it is gradually migrating from IPv4 to IPv6. Internet enables its users to share and access enormous amount of information worldwide. It uses WWW, FTP, email services, audio and video streaming etc. At huge level internet works on client server model.

Internet is serving many proposes and is involved in many aspects of life. Some of them are:

1) Websites
2) Email
3) Instant messaging
4) Blogging
5) Social media
6) Marketing
7) Networking
8) Resource sharing
9) Audio and video streaming

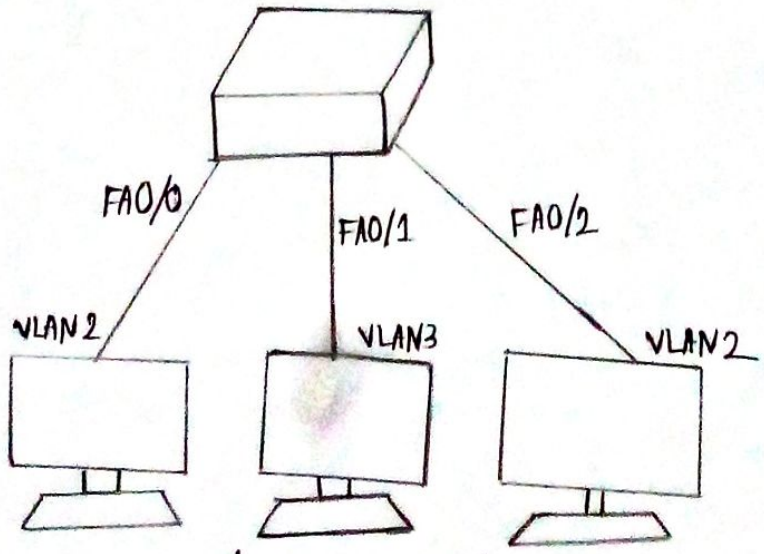
Q) What is virtual LAN and how it works?

Ans: A virtual LAN is a subnetwork which can group together collections of devices on separate physical Local Area Networks.

LAN uses Ethernet which in turn works on shared media. Shared media in Ethernet create one

single Broadcast domain and one single collision domain. Introduction of switches to Ethernet has removed single collision domain issue and each device connected to switch works in its separate collision domain. But even switches cannot divide a network into separate Broadcast domains.

Virtual LAN is a solution to divide a single Broadcast domain into multiple Broadcast domains. Host in one VLAN cannot speak to a host in another. By default, all hosts are placed into the same VLAN



Virtual LAN protocol

Ques 3. a) What is network topology? Describe different types of topology.

Ans: A network topology is the arrangement with which computer systems or network devices are connected to each other.

There are different types of topology. They are-

Bus topology: In case of Bus topology, all devices share single communication line or cable. Bus topology may have problem while multiple hosts sending data at the same time

Star topology: All hosts in star topology are connected to a central device, known as hub device, using a point to point connection. That is there exists a point to point connection between hosts and hub. The hub device can be any of the following:

1) Layer-1 device such as hub or repeater
2) Layer-2 device such as switch or bridge
3) Layer-3 device such as router or gateway

Ring topology : In ring topology each host machine connects to exactly two other machines creating a circular network structure. When one host tries to communicate or send message to a host which is not adjacent to it, the data travels through all intermediate hosts. To connect one more host in the existing structure, the administrator may need only one more extra cable.

Mesh topology : In this type of topology a host is connected to one or multiple hosts. This topology has hosts in point-to-point connection with every other host or may also have hosts which are in point-to-point connection to few hosts only.

b) Difference between Star topology and Ring topology:

Star topology	Ring topology
1. A network topology where each individual device of the network is attached to one central node.	1. A network configuration in which device connections create a circular data path.
2. Failure in the central node affects the entire network, but failure in one device does not affect the entire network.	2. Failure in one device affects the whole network.
3. All the devices connect to one central device	3. Each device connects to two devices.
4. Easier to troubleshoot.	4. Difficult to troubleshoot

5. Data from all devices passes through the central mode.	5. Data travels from one device to another in a sequential manner until reaching the destination
6. Higher cost	6. Lower cost

c) Which topology is best and why? Give reasons.

Ans: Well it depends upon the environment we are going to use for. Mainly there are four types of topology, we can consider anyone according to our needs.

1) Mesh topology: All workstations are connected to each other dedicatedly.

Advantage: Dedicated connection for all workstations

Disadvantage: The more wires required for each connection.

2) Star topology: All workstations are connected to

- the central switch or hub.

Advantage: other workstations can connect easily without affecting rest of the network.

Disadvantage: If the central switch or hub fails, nodes attached are disabled.

3) Bus topology: All workstations are connected to a single cable.

Advantage: Requires less cable length

Disadvantage: Entire network crashes, if there is a break in the main cable.

4) Ring topology: All workstations are connected to each other in such a way that they make a loop through which data is passed from one workstation to another easily.

Advantage: Data is quickly transferred & all data traffic is in the same direction.

Disadvantage: If one workstation goes down, the other workstations will be effected.

4 a) What is OSI model? What are the layers of OSI model

Ans: Open System Interconnect is an open standard for all communication systems. OSI model is established by International Standard Organization.

This model has seven layers.

1. Application layer: This layer is responsible for providing interface to the application user.

2. Presentation layer: This layer defines how data in the native format of remote host should be presented in the native format of host.

3. Session layer: This layer maintains sessions between remote hosts

4. Transport layer: This layer is responsible for end-to-end delivery between hosts.

5. Network layer: This layer is responsible for

address assignment and uniquely addressing hosts on a network.

6 Data link layer: This layer is responsible for reading and writing data from and onto the line. Link errors are detected at this layer.

7 Physical layer: This layer defines the hardware, cabling wiring, powere output, pulse rate etc.

b) Describe about Internet Model

Ans: Internet uses TCP/IP protocol suite also known as Internet suite. This defines Internet Model which contains four layered architecture. OSI model is general communication model but Internet Model is what the internet uses for all its communication. The internet is independent of its underlying network architecture so its model the model has the following layers:

1 Application layer: This layer defines the protocol

which enables user to interact with the network. For example, FTP, HTTP etc.

2. Transport layer: This layer defines how data should flow between hosts. Major protocol at this layer is Transmission Control protocol (TCP). This layer ensures data delivered between hosts is in-order and is responsible for end-to-end delivery.

3. Internet layer: Internet protocol (IP) works on this layer. This layer facilitates host addressing and recognition. This layer defines routing.

4. Link layer: This layer provides mechanism of sending and receiving actual data. Unlike its OSI model counterpart, this layer is independent of underlying network architecture and hardware.

c) What is cryptography? Describe the cryptographic algorithms.

Ans: Cryptography is a technique to encrypt the plain-text data which makes it difficult to understand and interpret. There are several cryptographic algorithms available present day as described below:

* Secret key
* Public key
* Message Digest

Secret key Encryption: Both sender and receiver have one secret key. This secret key is used to encrypt the data at sender's end. After the data is encryted, it is sent on the public domain to the receiver. Because the receiver knows and has the secret key, the encrypted

data packets can easely be decrypted. Example of secret key Encryption is Data Encryption Standard (DES)

Public key Encryption : In this encryption system, every user has its own secret key and it is not in the shared domain. The secret key is never revealed on public domain. Public key is always made public and is used by senders to encrypt the data when the user receives the encrypted data, he can easily decrept it by using its own secret key. Example of public key encription is Rivest-Shamir-Adleman (RSA).

Message Digest : In this method, actual data is not sent instead a hash value is calculated and sent. The other end user computes its own hash value and compares with the one just received. If both hash values are matched, then it is accepted otherwise rejected. Example of message Digest is MD5 hashing.

ans5. a) What is Application layer? What are the functions of application layer?

Ans: An application layer is an abstraction layer that specifies the shared communications protocols and interface methods used by hosts in a communications network. The application layer abstraction is used in both of the standard models of computer networking: the internet protocol suite (TCP/IP) and the OSI model

Application layer functions:

Transport access and management: It allows a user to access, retrieve and manage files in a remote computer.

mail services: It provides the basis for email forwarding and storage facilities.

Virtual terminal: For various reasons, it can be said that the standardization of terminals has completely failed. The OSI solution to this problem is to define a virtual terminal that is really just an abstract data structure that takes the abstract state of the actual terminal. This abstract data structure can be operated by both the keyboard and the computer reflects the current state of the data structure on the display. The computer can query this abstract data structure and change this abstract data structure so that the output appears on the screen.

In addition to the three functions above, there are some other functions: directory services, remote job entry, graphics, information, communication etc.

b) Draw the OSI Model for Application layer.

Ans: ISO 7-layer Model

Applications communicate using services of 7 layers

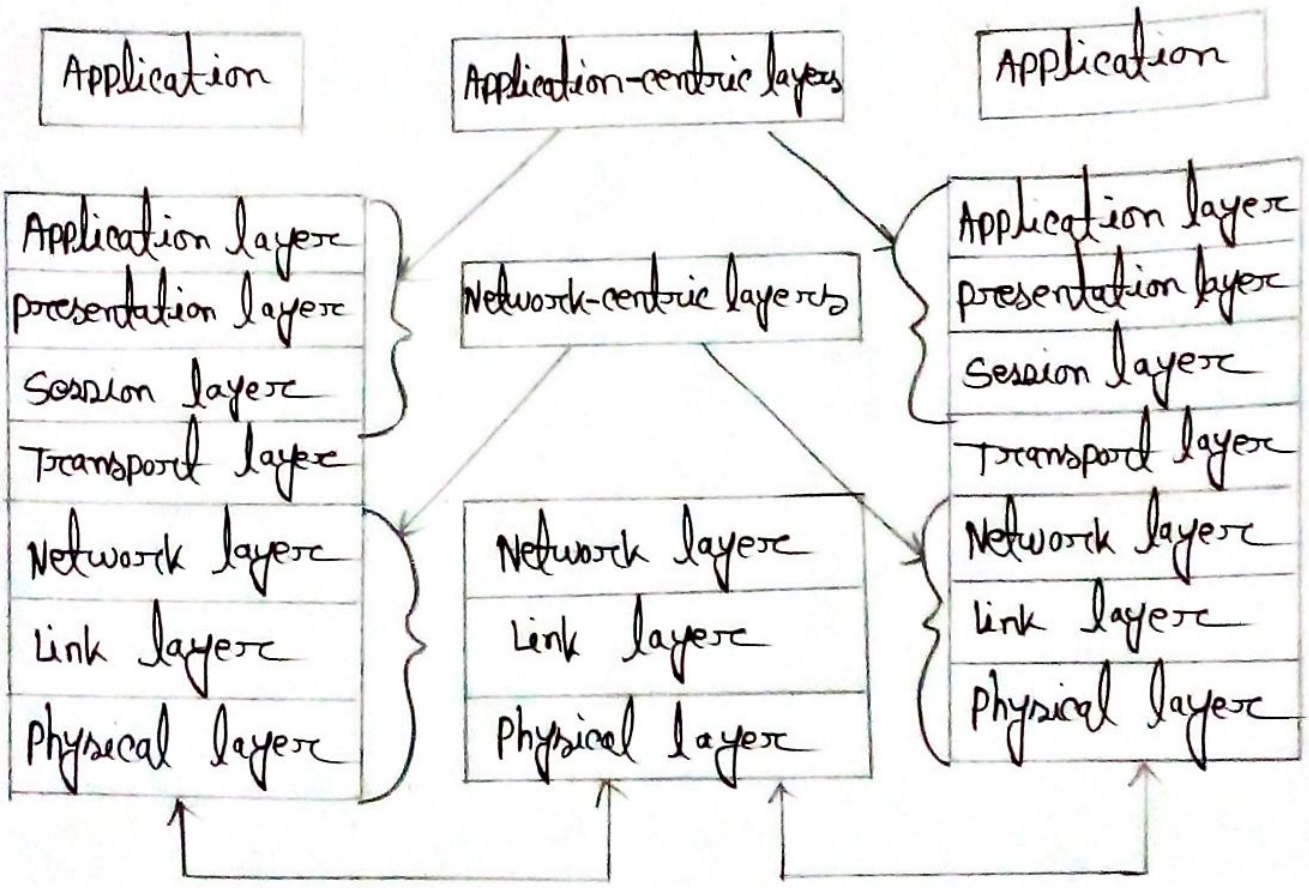


Fig: Application layer of OSI model

c) Describe different types of Application layer protocol

Ans: There are several protocols which work for users on Application layer. Application layer protocols can be broadly divided into two categories:

→ protocols which are used by users. For example email.

→ protocols which help and support protocols used by users. For example, DNS.

Domain Name System: The Domain Name System (DNS) works on client server model. It uses UDP protocol for transport layer communication.

Simple Mail Transfer protocol: The Simple Mail Transfer protocol (SMTP) is used to transfer electronic mail from one user to

another. This task is done by means of email client software the user is using.

File transfer protocol: The File Transfer Protocol (FTP) is the most widely used protocol for file transfer over the network. FTP uses TCP/IP for communication and it works on TCP port 21.

Post office protocol: The post office protocol version 3 (POP 3) is a simple mail retrieval protocol used by user agents to retrieve mails from the mail server.

Hyper Text Transfer Protocol (HTTP): The Hyper Text Transfer protocol (HTTP) is the foundation of world wide web. Hypertext is well organized documentation system which uses hyperlinks to link the pages in the text documents. HTTP works on client server model.

ques 6 a) Write the difference between peer-to-peer and client server network.

Ans: Difference between peer-to-peer & client server:

client server Network	peer-to-peer Network
1. In client server network clients and server are differentiated	1. In peer-to-peer network, clients and server are not differentiated.
2. Client server network focuses on information sharing	2 Peer-to-peer Network focuses on connectivity
3. Centralized server is used to store the data.	3. Each pair has its own data.
4. Server respond the services which is request by client	4. Each and every node can do both request and respond for the services.

5 Client server network are costlier than peer-to-peer network.	5. peer-to-peer network are less costlier than client server network
6. client server network are more stable than peer-to-peer network	6. peer-to-peer network are less stable if number of peer is increase.
7. client server network is used for both small and large networks	7. Peer-to-peer Network is suited for small networks with fewer than 10 computers.

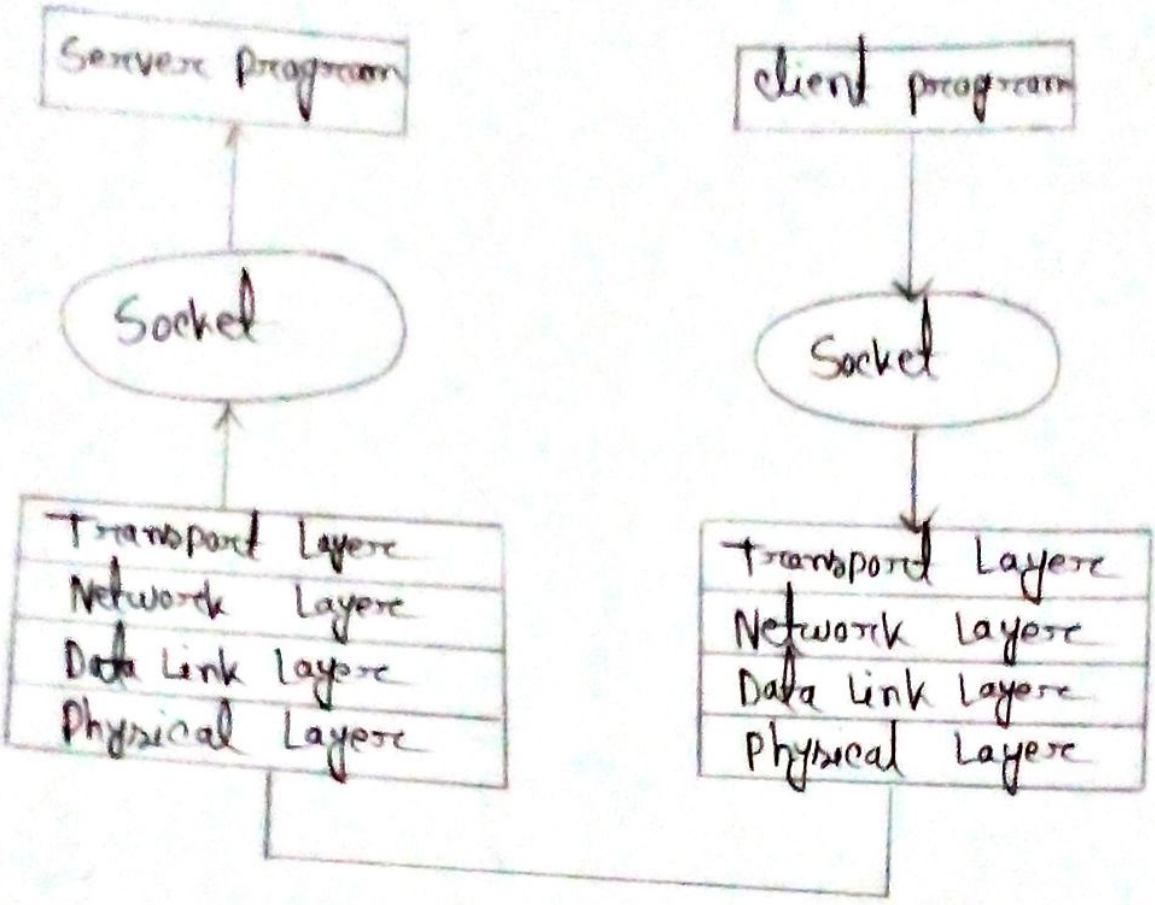
b) Write the process for communication in client server model.

Ans: To process in client-server model can interact in various ways.

* Sockets
* Remote procedure calls (RPC)

Sockets: In this paradigm, the process acting as server opens a socket using a well-known

port and waits until some client requests comes. The second process acting as a client also opens a socket but instead of waiting for an incoming request, the client processes requests first.



When the request is reached to server, it is served. It can either be an information sharing or resource request.

Remote procedure call :- This is a mechanism where one process interacts with another by means of Remote procedure calls.

This communication happens in the following way.

The client process calls the client stub. It passes all the parameters pertaining to program local to it.

All parameters are then packed and a system call is made to send them to other side of the network.

kernel sends the data over the network and the other end receives it.

The remote host passes data to the server stub where it is unmarshalled.

The parameters are passed to the procedure and the procedure is then executed.

The result is sent back to the client in the same manner.

a) Write the advantages and disadvantages of client server network.

Ans: Client Server Network: Advantages & Disadvantages

Advantages	Disadvantages
1. All files are stored in a central location 2. Network peripherals are controlled centrally 3. Backups and network security is controlled centrally. 4. Users can access shared data which is centrally controlled 5. The capacity of client and servers can be changed separately.	1. A specialist network operating system is needed. 2. The server is expensive to purchase 3. Specialist staff such as a network manager is needed. 4. If any part of the network fails a lot of disruption can occur.

Ques 7 a) What is network service? What are the types of network services?

Network service is a capability that facilates a network operation. It is typically provided by a server based on network protocols running at the application layer in the open system interconnection (OSI) model of the network. Some examples are DNS, DHCP, VOIP etc.

There are some basic services computer network can offer. They are -

1 Directory services: This services are mapping between name and its value which can be variable value or fixed.

2. File services

3 Communication services

4 Application services

b) Describe about communication services

Ans: Communication services are;

Email: Electronic mail is a communication method and something a computer user cannot work without. This is the basis of today's internet features. Email has one or more email servers. When a user sends email to other user, it is actually transferred between users with help of email server

Social Networking: Recent technologies have made technical life social. The computer savy peoples, can find other known peoples or friends, can connect with them, can share thoughts, pictures, video.

Internet chat: Internet chat provides instant text transfer services between two hosts. Two or more people can communicate with each other using text based Internet Relay chat services. Voice chat and video chat are common now.

Discussion boards: Discussion boards provide a mechanism to connect multiple peoples with same interests. It enables the users to put queries, questions, suggestions etc. which can be seen by all other users. Other may respond as well.

Remote access: This service enables users to access the data residing on the remote computer. This feature is known as Remote desktop. This can be done via some remote device eg mobile phone or computer.

c) How does file service work?

Ans: File service include sharing and transferring files over the network.

File sharing: One of the reason which gave birth to networking was file sharing. File sharing enables its users to share their data with other users.

Users can upload the file to a specific servers, which is accessible by all intended users. As an alternative, user can make its file shared on its own computer and provides access to intended users.

File transfer: This is an activity to copy or move file from one computer to another computer or to multiple computers, with help of underlying network.

Network enables its user to locate other users in the network and transfer files.

In this way, File server is sharing and transferring files over the network.

Ques.8 a) What is Application service? How does it work?

Ans: Application service provide the Application capabilities that are required to support the Business capabilities. These are nothing but providing network based services to the users such as web services, database managing and resource sharing.

Resource sharing: To uses resources efficiently and economically, network provides a mean to share them. This may include servers, printers, and storage media etc.

Databases: This application service is one of the most important services. It stores data and information, processes it, and enables the users to retrieve it efficiently by using queries.

Databases help organizations to make decisions based on statistics.

Web services: World Wide Web has become the synonym for internet. It is used to connect to the internet, and access files and information services provided by the internet servers.

b) Write the difference between LAN, MAN and WAN

Ans: Difference between LAN, MAN and WAN:

LAN	MAN	WAN
1. LAN stands for Local Area Network	1. MAN stands for Metropolitan Area Network	1. WAN stands for Wide Area Network
2 LAN is often owned by private organizations	2. MAN ownership can be private or public	2. WAN ownership can be private or public

3 LAN speed is quiet high	3 MAN speed is average	3. WAN speed is lower than that of LAN
4. Network propagation delay is short in LAN	4 Network propagation delay is moderate in MAN	4. Network propagation delay in longer in WAN
5 LAN has low congestion as compared to WAN	5. MAN has higher congestion than LAN	5. WAN has higher congestion than both MAN and LAN
6. Fault tolerance of LAN is higher than WAN	6 Fault tolerance of MAN is lower than LAN.	6. Fault tolerance of WAN is lower than both LAN and MAN.
7. Designing and maintaining LAN is easy and less costly than WAN.	7. Designing and maintaining WAN is complex and more costly than LAN	7. Designing and maintaining WAN is complex and more costly than both LAN and MAN

c) Write the importance of computer networking.

Ans: Importance of computer networking:

In the world of Information Technology (IT) information is building block for effective communication. Communication is medium that helps us to drive our day to day professional and personal operations. Where computer networking acts as base of everything as the best and most important IT solutions. Below is list of points that we do with the help of computer networks or things that we get benefited with the help of computer networks or it has become possible or effective due to computer network. Let us know all points and then we can understand importance of computer networking.

1. Provides a best way of business communication
2. Streamline Communication
3. Cost-effective resource sharing
4. Improving storage efficiency and volume
5. Cut costs on software
6. Cut costs on hardware
7. Utilizes Centralized database
8. Increase in efficiency
9. Optimize convenience and flexibility
10. Allows file sharing
11. Sharing of peripherals and internet access
12. Network gaming
13. Voice over IP
14. Media centre service
15. Flexibility
16. User communication