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- ① i) What is data communication, and what is needed for communication? (4)
- ii) Briefly describe the fundamental characteristics of data communication. What are the five components of data communication system? (4)
- iii) What is network advantage and dis-advantage? Why is message switching better than circuit switching? (6)

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2. i) Define computer network (2)
ii) Briefly explain the classification of computer network (5).
iii) Differentiate between, different types of computer network (7)

3. i) What are the applications of communications and computer network? (3)

ii) Why we should learn data communication and computer network? (5)

iii) Write down the effectiveness in data communication? Write down network criteria (3+3)

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4. i) Define briefly PAN, LAN, WAN, MAN ? (10)

ii) What is internetwork ? (2)

iii) Why internet is known as the best computer network ? (2)

5. i) Describe various LAN technologies. (5)

ii) Define OSI model and explain the layers in it. (9)

iii) Define internet model. What are the layers in internet model (9)

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6. i) What is topology? (3)

ii) Describe different types of topologies (10).

7. i) What is DNS? (2)

ii) Define (10)

a) SMTP

b) FTP

c) POP

d) HTTP

iii) Application layer can be divided into how much categories? (2)

or wireless signals.

for example, a common example of data communications is a computer connected to the internet via a Wi-Fi connection, which uses a wireless medium to send and receive data from one or more remote servers.

some devices used in data communication are known as data communication equipment (DCE) and data terminal equipment (DTE). DCE is used at the sending node and DTE is used at the receiving node.

Answer to the question no 1(a)

Q. What is data communication, and what is needed for communication? (7)

Answer: Data communication means, the exchange of data between two devices via some form of transmission medium such as a wire cable.

Data communication incorporates several techniques and technologies with the primary objective of enabling any form of electronic communication. These technologies include telecommunications, computer networking and radio/satellite communication. Data communication usually requires existence of a transportation or communication medium between the nodes wanting to communicate with each other, such as copper wire, fiber optic cables.

Answer to the question no 1 (b)

Q. Briefly describe the fundamental characteristics of data communication. What are the five components of data communication system?

Answer: The effectiveness of a data communications system depends on four fundamental characteristics.

1. Delivery: The intended destination only should receive the transmitted data, i.e. the data delivery should be correct.

2. Accuracy: The transmitted data must be delivered to the destination without any alterations. Otherwise, it will be of no use.

3. Timeliness: The transmitted data must be delivered to the destination in time without any delay.

4. Jitter: The uneven delay in the arrival of audio and video packets at the destination is called jitter. In real-time transmission, it should be constant i.e. audio and video data packets should be delivered at a constant rate.

The five components of data communication system are:-

1. message
2. Sender
3. Receiver
4. Transmission medium
5. Protocol,

Disadvantages:-

- ✓ Purchasing the network cabling and file server can be expensive.
 - ✓ Managing a large network is complicated, requires training and a network manager usually needs to be employed.
 - ✓ If the file server breaks down, the files on the file server becomes inaccessible.
- Both the circuit switching and message switching are the methods used to connect different devices with each other. The main difference between circuit switching is done by setting a physical path between two systems while message switching works on store and forward methods.

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8. i) In the client-server paradigm, explain why a server should be run all the time, but a client can be run when it is needed. (3)

ii) Most of the operating systems installed on personal computers come with several client processes, but normally no server process. Explain reason. What is TCP service model? Does Netflix use TCP or UDP?

iii) Describe the main difference between Subnetting and supernetting. Is 5g faster than Ethernet?

Answer to the question no. 1 (c)

Q. Network advantage and disadvantage ?

Why is message switching better than circuit switching ?

Answer :-

Advantages :-

- ✓ Sharing devices such as printers saves money
- ✓ Site licences are likely to be cheaper than buying several standalone licences.
- ✓ Files can easily be shared between users.
- ✓ Network users can communicate by email and instant messenger.
- ✓ Security is good - users can't see other users' files unlike on stand-alone machines.
- ✓ Data is easy to backup as all the data is stored on the file server.

1. Network Architecture:-

Computer networks can be discriminated into various types such as client-server, peer-to-peer or hybrid, depending upon on it's architecture.

- a) There can be one or more system acting as server.
- b) Two systems can be connected point to point, or in back-to-back fashion. They both reside at the same level and called peers.
- c) There can be hybrid network which involves network architecture of both the above types.



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2. Inter-connectivity :-

Components of a network can be connected to each other differently in some fashion.

By connectedness we mean either logically physically or both ways.

i. Every single device can be connected to every other device on network, making the network mesh.

ii. All devices can be connected to a single medium but geographically disconnected created bus like structure.

iii. Each device is connected to its left and right peers only, creating linear structure.

3. Administration :- From an administrator's point of view, a network can be private, network which belongs a single autonomous system and can't be accessed outside its physical or logical domain.

- a. Geographical Span
- b. Inter-connectivity
- c. Administration
- d. Architecture

1. Geographical span: Geographically a network can be seen in one of the following categories:

- i. It may be spanned across your table, among Bluetooth enabled devices, . Ranging not more than few meters.
- ii. It may be spanned across a whole building ,including intermediate devices to connect all floors,
- iii. It may be spanned across a whole city.
- iv. It may be across multiple cities or provinces and also covering whole world .

Answer to the question no 2 (a)

Q. Define computer network.

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

Answer to the question no 2 (b)

Q. Briefly explain the classification of computer network.

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

Wide Area Network : As the name suggests the wide area network (WAN) covers a wide area which may span across provinces and even a whole country. Generally, telecommunication networks are wide area network. These networks provide connectivity to MANs and LANs. Since they are equipped with very high speed backbone, WANs are very expensive network equipment. WAN may use advanced technologies such as Asynchronous Transfer Mode (ATM), frame Relay and Synchronous Optical Network (SONET). WAN may be managed by multiple administration.

Internetwork : A network of networks is called an internetwork, or simply the Internet. It is the largest

Local Area Network: A computer network spanned inside a building and operated under single administrative system is generally termed as LAN. Usually, LAN covers an organization offices, schools, colleges or universities. Number of system connected in LAN may vary from as least as two as much as 16 million.

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 Fiber Distributed Data Interface (FDDI). Metro ethernet is a service which provided by ISPs. This service enables its users to expand their local area networks.

Answer to the question no 2 (c)

Q. Differentiate between computer network types with examples.

Answer:

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 upto 10 meters. PAN may include wireless computer keyboard and mouse. For example, piconet is Bluetooth enabled PAN which may contain up to 8 devices connected together in a master-slave fashion.

interface on a system, as explained in How IP address Apply to network Interfaces. An IPv4 address is written in decimal digits divided into four 8-bit fields that are separated by periods. Each 8-bit fields represents a byte of the IPv4 address.

255.255.255.255:- This address is reserved for network broadcasts or messages that should go to all computers on the network. 127.0.0.1 - This is called the loop-back address, meaning your computer's way of identifying itself, whether or not it has an assigned IP address.

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.

Q. 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. Internet uses TCP/IP protocol suite and uses IP as its addressing protocol. Present day, Internet is widely implemented using IPv4.

Answer to the question no 3 (c)

Q. What is IPv4 addressing? What destination address is 255.255.255.255 for?

Answer: The IPv4 address is a 32-bit number that uniquely identifies a network.

Answer to the question no-3 (b)

Q. Why we should learn data communication and computer network?

Answer: - The importance of learning data communication and computer network are given below;

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

2. Network-Engineering: Network engineering is a complicated task, which involves software, firmware, chip level engineering, hardware and electric pulses.

Answer to the question no - 3 (a)

Q. What are the applications of communication and computer network?

Answer: The applications of communication and computer network is given below:

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 user - using dynamic web pages.
5. IP phones
6. Video conferences.
7. Parallel computing
8. Instant messaging.

network in existence on this planet. 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. Some of them are:-

- a) Web sites
- b) E-mail
- c) Instant Messaging
- d) Blogging
- e) Social media
- f) Marketing
- g) Networking
- h) Resource sharing
- i) Audio streaming.

MAN: The metropolitan area network generally expands throughout a city such as cable TV network. It can be in the form of Ethernet Token-ring, ATM or Fiber Distributed Data Interface (FDDI). Metro Ethernet is a service which is provided by ISPs. This service enables its users to expand their Local Area Networks.

Answer to the question no. 9 (b)

Q. What is internetwork?

Answer: A network of networks is called an internetwork or simply the internet. It is the largest network in existence on this planet.

Answer to the question no 4 (a)

Q. Briefly define LAN, WAN, PAN, MAN.

Answer:

PAN: A personal area network is smallest network which is very personal to a user. This may include Bluetooth enable devices or infra-red enable devices. PAN has connectivity range upto 10 meters. PAN may include wireless computer keyboard and mouse, Bluetooth enabled headphones, wireless printers and TV remotes.

LAN: A computer network spanned inside a building and operated under single administrative system is generally termed as Local Area Network. Usually LAN covers an organization offices, schools, college or universities.

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, power output, pulse rate etc.

Answer to the question no 5 (c)

Q. Define internet model. What are the layers in internet model?

Answer: 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 users for all its communication.

The internet is independent of its underlying

Protocols which directly interact with the 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. For example, once user/password authentication is done, the remote host maintains this session for a while and does not ask for authentication again in that time span.

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 in a network.

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.

Answer to the question no 5 (b)

Q. Define OSI model and Explain the layers in it.

Answer: Open system interconnect is an open standard for all communication systems. OSI model is established by International Standard Organization (ISO). This model has seven layers.

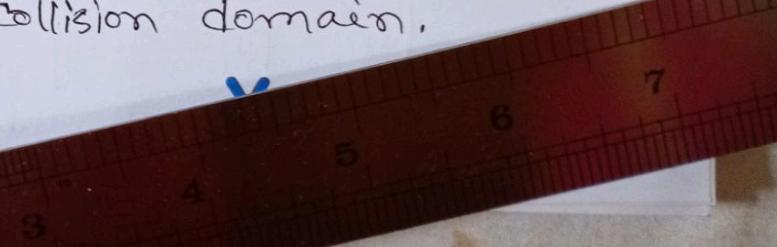
1. Application layer: This layer is responsible for providing interface to the application user. This layer encompasses

100 BASE-T in IEEE-802.3 using cat-5 twisted pair cable. It uses CSMA/CD technique for wired media sharing among the Ethernet hosts and CSMA/CA technique for wireless Ethernet LAN.

Giga Ethernet: After being introduced in 1995, Fast-Ethernet could enjoy its high-speed status only for 3 years till Giga-Ethernet introduced. Giga-Ethernet provides speed up to 1000 mbit/seconds. IEEE 802.3ab standardize Giga-Ethernet over UTP using cat-5, cat-5e and cat-6 cables. IEEE 802.3ah defines giga-ethernet over fiber.

Virtual LAN:

LAN uses Ethernet which in turn works on shared media. Shared media in Ethernet create one single broadcast domain and one single collision domain.



Answer to the question no 5 (a)

Q. Describe various LAN Technologies.

Answer

Ethernet: Ethernet is a widely deployed LAN technology. Ethernet shares media network which uses Carrier Sense Multi Access / Collision Detection (CSMA/CD) technology to detect collisions. On the occurrence of collision in Ethernet, all its hosts roll back, wait for some random amount of time, and then re-transmit the data.

Fast-Ethernet: To encompass need of fast emerging software and hardware technologies, Ethernet extends itself as Fast-Ethernet.

It can run on UTP, Optical fiber, and wirelessly too. It can provide speed up to 100 MBPS. This standard is named as

travels through all intermediate hosts. To connect one more host in the existing structure, the administrator may need only one more extra cable. Failure of any host results in failure of the whole ring. Thus every connection in the ring is a point of failure. There are methods which employ one more backup ring.

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 hosts or may also have hosts which are in point to point connection to few hosts only. Hosts in mesh topology also work as relay for other hosts which do not

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 exist a point-to-point connection between hosts and hub. The hub device can be one of the following:-

- Layer-1 device such as hub
- Layer-2 device such as switch
- Layer-3 device such as router

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

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. Therefore, Bus topology either uses CSMA/CD technology or recognize one host as Bus Master to solve the issue. It is one of the simple forms of networking where a failure of a device does not affect the other devices. But failure of the shared communication line can make all other device stop functioning. Both ends of the shared channel have line terminator. The data is sent in only one direction and as soon as it reaches the extreme end.



Answer to the question no 6 (a+b)

Q. What is topology and describe different types of topologies.

Answer: A Network topology is the arrangement with which computer systems or network devices are connected to each other. Topologies may define both physical and logical aspect of the network.

Both logical and physical topologies could be same or different in same network.

Point - to - Point: point to point networks contains exactly two hosts such as computer switches or routers servers connected back to back using a single piece of cable. Often, the receiving end of one host is connected to sending end of the other and vice-versa.

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network architecture so is its model. This 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.

3. Internet Layer: 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.

Answer to the question no 7(a)

Q. What is DNS.?

Answer: DNS stands for Domain

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

Answer to the question no 7(b)

Q. Define SMTP, FTP, HTTP, POP.

Answer:

SMTP: Stands for Simple Mail Transfer protocol. It is used to transfer electronic mail from one user to another. This task is done by means of email



direct point to point links.

Tree Topology: Also known as hierarchical Topology, this is the most common form of network topology in use.

Presently, this topology imitates as extended star topology and inherits properties of bus topology.

Hybrid Topology: A network structure whose design contains more than one topology is said to be hybrid topology. Hybrid topology inherits merits and demerits of all the incorporating topologies.

several connections from clients at the same time.

TCP service model: TCP service is obtained by both the sender and receiver creating end points, called sockets. A socket may be used for multiple connections at the same time. All TCP connections are full duplex and point to point. Full duplex means that, the traffic can go in both directions at the same time. Netflix, Hulu, YouTube etc. Video streaming all use TCP and simply buffers a few seconds of content, instead of using UDP since the delay is not crucial and TCP transfers can be easily accomplished over HTTP and web browsers without the need for additional plugins and software.

Answer to the question no 8 (a)

Q. In the client server paradigm, explain why a server should be run all the time but a client can be run when it is needed.

Answer: A server should always be on because a client may need to access it at any time. A client is normally the initialiser of the connection; it can be run when it is needed.

Answer to the question no 8(b)

Answer: A personal computer, such as a desktop or laptop, is normally used as a client. If a business needs to use a computer as a server, it should be more powerful to allow

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HTTP: stands for Hyper Text Transfer Protocol. It 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. When user wants to access any HTTP page on the internet, the client machine at user end initiates a TCP connection to server on port 80.

Answer to the question no - 7 (c)

There are several protocols which work for users in Application Layer. Application layer protocols can be broadly divided into two categories.

- Protocols which are used by user.
- Protocols which help and support protocols used by user.

client software. The user is using User agents help the user to type and format the email and store it until internet is available.

FTP: stands for file transfer protocol, it 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. FTP works on client server Model where a client request file from Server and server sends requested resource back to the client.

POP: stands for post office protocol. It is a simple mail retrieval protocol used by User Agents to retrieve mails from mail Server.

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5Gc isn't faster than Ethernet. 5Gc will be up to 10 Gbps, while the ethernet in its copper twisted pair incarnation can go up to 10 Gbps either, while in the optical fiber Ethernet, it can go up to 100 Gbps and higher.

Answer to the question no 8 (c)

Q. Describe the main difference between Subnetting and Supernetting. Is 5g faster than Ethernet?

Answer: Difference between Subnetting and Supernetting.

Subnetting	Supernetting
Subnetting is the procedure to devide the network into sub-network.	While supernetting is the procedure of combine the small networks.
In Subnetting, Network address bits are increased	While supernetting, Host address's bits are increased.
In subnetting, The mask bits are moved towards right.	The mask bits are moved towards left.
Address depletion is reduced for removed	While it is used for simplify routing process.