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Ques 01 What is difference between data communication and computer network? Why to learn it?

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

Learning purpose of communication and computer network is given below:-

(I) Network Basic Understanding: A ~~sys~~
of interconnected computers and computer
peripherals such as printers in
called computer network. computers may
connect to each other by either wired
or wireless media.

(II) Network Engineering: Network engi-
neering is a complicated task which involves
software, hardware, chip level engineering,
hardware and electric power. To ease
network engineering the whole networking
concept is divided into multiple layers.

(III) Internet: A network of networks in
called an internetwork or, simply
network. It is the largest network in
existence on this planet.

Q3

- (b) write down the application of communication and computer network?

Ans:- computer system and peripherals

are connected to form a network.

they provide numerous advantages.

- ① Resource sharing such as performing 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.

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- (6) Video conferencing.
 - (7) Parallel computing
 - (8) Instant messaging.
- (c) write down about DCN - computer network types.

Ans:- Generally, networks are distinguished based on their geographic span. A network can be small as our distance between our mobile phone and its bluetooth head phone and as large as the internet which covering the whole geographical world.

① Personal Area Network: A personal area network (PAN) is a small network which is very personal to a user. This may include Bluetooth enabled devices or infrared enabled devices.

② Local area network: A computer network spanned inside a building and operated under single administrative system is generally termed as Local area Network (LAN). Usually LAN covers an organization offices, schools, colleges, or universities. Number of system connected in LAN may vary from as less as two to as much as 16 mil

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(iii)

Metropolitan Area Network (MAN)

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.

(iv)

Wide Area Network (WAN)

Wide Area Network: As the name suggest, the wide area network (WAN) covers a wide area which may span across provinces and even a whole country. Generally, the telecommunication networks are Wide Area Networks. These networks provide connectivity to MAN's and LAN's. Since they are

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equipped with very high speed backbone
WAN's use very expensive network
equipment.

Small LAN's have limited bandwidth due
to collisions between multiple stations
attempting to access shared media

02

QUESTION & ANSWER

Q) What is Ethernet? Give description!

ANSWER

Ethernet is a widely developed LAN

Technology. Ethernet shares media. Network

which uses shared media has highly probability
of data collision. Ethernet uses carrier

sense multi access collision Detection (CSMA/CD)

Technology to detect collisions. On the

other occurrence of collision in Ethernet, it

will roll back, wait for some random

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amount of time, and then retransmit the data. Ethernet connector in, network interface card equipped with 48-bit MAC address. This helps other Ethernet devices to identify and communicate with remote devices in Ethernet. Traditional Ethernet uses 10BASE-T specifications.

The number 10 depicts 10Mbps speed. BASE stands for baseband and T stands for Thick Ethernet. 10BASE-T Ethernet provides transmission speed up to 10Mbps and uses coaxial cable or cat-5 twisted pair cable with RJ-45 connector. Ethernet follows star topology with segment length up to 100 meters. All devices are connected to a hub/switch in a star fashion.

Q9

b) what is virtual LAN? describe briefly.

Ans: LAN uses Ethernet which in turn

works on shared media. Shared media

in Ethernet create one single broadcast domain and on single collision domain.

Introduction of switches to Ethernet has removed single collision domain instead

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. Host in one VLAN

cannot speak to a host in another.

By default, All hosts are placed into the same VLAN. Hosts in one VLAN even if

connected on the same switch cannot

~~on the same switch a sec or speak~~

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Ques

- Ques to others in different VLANs. VLAN works in layer-2 technology. which works closely on Ethernet. To route packets between different VLANs a layer 3 device such as router is required. no firewall, or switches do not forward packets between VLANs. VLANs share broadcast domain of switches. Now lets discuss about different network topologies and their advantages & disadvantages.
- Ans: A network topology is the arrangement with which computer system or network devices are connected to each other. Topologies may define both physical and logical aspect of the network. Some forms of topologies are as follows:
- ① Bus: In this type of topology all the nodes are connected to a single backbone bus. All the nodes share the same bandwidth. It is a simple and cost-effective topology. Examples: Ethernet, Token Ring.
 - ② Star: In this type of topology, each node is connected to a central hub or switch. All the traffic passes through the central hub or switch. It provides better performance and reliability. Examples: FDDI, ATM.
 - ③ Ring: In this type of topology, nodes are connected in a closed loop. Every node receives data from its predecessor and sends data to its successor. Examples: Token Ring, FDDI.
 - ④ Mesh: In this type of topology, every node is connected to all other nodes. It provides maximum reliability and performance. Examples: Wide Area Network (WAN), Internet.
 - ⑤ Tree: In this type of topology, nodes are connected in a hierarchical structure. It is a combination of star and mesh topologies. Examples: Local Area Network (LAN), Wide Area Network (WAN).
 - ⑥ Hybrid: In this type of topology, two or more topologies are combined to form a hybrid topology. Examples: Bus-star, Mesh-tree.

Different types of topologies are given below:

① Point to point:-

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

② Bus Topology:- In case of Bus topology

In case of Bus topology all devices share single communication line of one cable. Bus topology may have problem with multiple hosts sending data at the same time. Therefore, Bus topology uses CSMA/CD technology or recognizes one host as Bus Master to solve the problem.

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It is one of the simple forms of network where a failure of a device does not affect the other devices.

or star or hub and spoke

(iii) Star topology: All host 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 between host and hub.

(iv) Ring topology: In ring topology each

host machine connects to exactly two other machines, creating a complete circular network structure. When one host trying to communicate or send message to a host which is not adjacent to it the data travels through all interconnected host.

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Failure of any host results in failure of the whole ring.

⑤ mesh topology: This is another type of topology where a host is connected to one or more 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.

⑥ Tree topology: This is the most common form of network, mainly in use presently. This topology imitates an extended star topology and inherits properties of bus topology. This topology divides the network into multiple layers.

VIII A Hybrid topology: A network structure whose design contains more than one topology is said to be hybrid topology.

Hybrid topology inherits merits and de-

merits of all incorporating topologies.

• Hybrid topology is a combination of bus and star topology.

• It is used in local area networks.

• It is used in wide area networks.

Q. What is computer network model?

Ans: A communication subsystem is a complex piece of hardware and software.

Fairly attempts for implementing the software for such subsystems were based on a single, complex, unstructured program with many interacting components.

The resultant software was very difficult to test and modify. To overcome such problem, the ISO have developed a layered approach. In a layered approach, networking concept is divided into several layers and each layer is assigned a particular task. Therefore, we can say that networking tasks depend upon the layers.

- ⑥ Describe the layered architecture of computer network model?

Ans:- The main aim of layered architecture is to divide the design into small pieces. Each lower layer adds its services to the higher layer to provide a full set of services to manage communications and

P.T.O.

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The layers help to run the applications. It provides modularity and clear interfaces i.e., it provides interaction between sub systems. It ensures the independence between layers, by providing the services from lower to higher layer without defining how the services are implemented. Therefore any modification in a layer will not affect the other layers. The number of layers, functions, contents of each layer will vary from network to network. However, the purpose of each layer is to provide the service from lower to a higher layer and hiding the details from the layers of how the services are implemented. In a layer in architecture

P.T.O

layers in one machine will have a communication with the layers in another machine and the rules used in a conversation are known as a layered protocol.

Q. What are the basic elements of layered architecture?

Ans: The basic elements of layered architecture are, services, protocols, and interfaces.

① Service: It is a set of actions that a layer provides to the higher layer.

② Protocol: It defines a set of rules that a layer uses to exchange the information with peer entity. These rules mainly concern

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about both the contents and order of the messages used.

(iii) Interface? It is a way through which the message is transferred from one layer to another layer.

(d) What is OSI model? Describe it.

Ans: 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 protocols which directly interact with the user.
- ② Presentation layer: This layer delivers raw 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.

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

that hardware cabling, wiring, power output, pulse rate etc.

Q Define Internet model and describe about its layers.

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

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① Application layer; This layer activates

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; 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.

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- ⑥ Write down about computer network security.

Ans: During initial days of internet, its use was limited to military and universities for research and development purpose. Later when all networks merged together and formed internet, the data used to travel through public transit network. Common people may send the data that can be highly sensitive such as their bank credentials, username, passwords, personal accounts, online shopping details, or confidential documents. Security threats can be divided into the following categories:

- ① Interruption: Interruption is a security threat in which availability of

resources is attacked. For example, a user is unable to access its web-server, or the web-server hijacked

② Privacy: In this threat, the privacy of data is compromised. Someone who is not the authorized person is accessing or intercepting data sent or received by the original authenticated user.

③ Integrity: This type of threat includes any alteration or modification in the original context of communication. The attacker intercepts and receives the data sent by the sender and the attacker then either modifies or generates false data and sends to the receiver.

② Authenticity: This threat occurs when an attacker or a security violator, passes as a genuine person, and accesses the resources or communicates with other genuine users.

③ Write down about cryptography and its techniques?

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

① Secret key: Both sender and receiver

have one secret key. This secret key is

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used to encrypt the data at sender's end. After the data is encrypted, it is sent on the public domain to the receiver. Because the receiver knows and has the secret key, the encrypted data packets can easily be decrypted.

② 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. Along with secret key, every user has its own but public key. Public key is always made public and used by senders to encrypt the data.

③ message digest: In this method, actual data is not sent, instead a hash value is calculated and sent. The other end user, computer its own hash value yet to be got at signal verification time and compares with the one just received. If both hash values are matched, then it is accepted otherwise rejected.

(a) Write down about Application layer model.

Ans:- Application layer is the top most layer in OSI and TCP/IP layered model. This layer exists in both layered model because of its significance of interacting with user and user applications. This layer is for application which are involved in communication system. A user may or may not directly interact with the applications. Application layer is where the actual communication is initiated and reflected. Because this layer is on the top of the layer stack, it does not serve any other layers. Application layer takes the help of Transport and all layers below it to communicate or

transfers its data to the remote host. When an application layer protocol wants to communicate with its peer application layer protocol on remote host, it hands over the data or information to the transport layer. The transport layer does the rest with the help of all the layers below it.

(b) Briefly describe the functions of application layer in OSI model.

Ans: The application layer is the top-most layer of OSI model. It provides services directly to user applications. It enables them to access the network. It provides

To user interfaces and support for services such as email, remote file access and transfer, shared database management and other types of distributed information services.

① File transfer: It allows a user to access, retrieve and manage files in a remote computer.

② mail services: It provides facilities for email forwarding and storage facilities.

③ Directory services: It provides distributed database sources and access for global information about various objects and services.

① Describe the function of application layer in TCP/IP model?

Ans: The application layer is the highest abstraction layer of the TCP/IP model that provides the interfaces and protocols needed by the user. It combines the functions of the session layer, the presentation layer and the application layer of the OSI model. The functions of the application layer are:

- ① It facilitates the user to use the services of the network.
- ② It is used to develop network-based applications.
- ③ It provides user services like user login, naming network devices, formatting messages and remains, transfer to files.

Q) It is also concerned with error handling and recovery of the message as a whole.

Forwarding of signals without loss in INT form.

How INT can do signal processing.

Q) Which protocols are used by application layer in TCP/IP model?

INT can do signal processing.

Ans: ~~HTTP~~ ~~gives~~ Application layer uses a number of protocols, the main among which are follows:

① ~~IP~~ ~~can~~ or ~~can~~ INT established + ②

① HTTP - It is the underlying protocol for world wide web. It defines how hyper media messages are formatted and transmitted.

② ~~can~~ or ~~can~~ INT arriving + ③

④ ~~can~~ or ~~can~~ INT arriving + ⑤

(i) FTP - It is a client-server based protocol for transfer of files between client and server over the network.

(ii) SMTP - It lays down the rules and semantics for sending and receiving electronic mails.

(iii) DNS - It is a main naming system for devices in networks, it provides services for translating domain names to IP address.

(iv) TELNET - It provides bi-directional text oriented services for remote login to the hosts over the network.

(v) SNMP - It is managing, monitoring the network and for organizing information about the networked devices.

Q) Describe client server model.

Ans: Two remote application processes can communicate mainly in two different fashions:

(i) Peer-to-peer: Both remote processes are executing at same level and they exchange data using some shared resource.

(ii) client - server: One remote process can act as a client and requests some resource from another application process acting as server.

In client server model, any process can act as server or client. It is not the type of machine, size of the machine,

or its computing power which makes it
server; it is the ability of receiving request
that makes a machine
system can act as server and client
simultaneously. That is, one process is acting
as server and another is acting as a
client. This may also happen that both
client and server process reside on the
same machine.

(b) Describe the communication process
of client-server model.

Ans: Two processes in client-server
model can interact in various ways,

① Sockets: In this paradigm, the process acting as server opens a socket using a well-known port and waits until some client request comes. The second process acting as a client also opens a socket but instead of waiting for an incoming request, the client process can 'request' first. When the request is reached to server, it is served. It can either be an information sharing or resource request.

② Remote procedure call: This is a mechanism where one process interacts with another by means of procedure calls. One process calls the procedure lying on remote host. The process on remote host.

is said to be serving. Both processes are allocated stubs. This communication happens in the following way:-

- ① The client process calls the client stub. It passes all the parameters pertaining to program local to it.
- ② All parameters are then packed and a system call is made to send them to other side of the network.
- ③ Kernel sends the data through all and the other end receives it.
- ④ The remote host passes data to the server stub where it is unmarshalled.
- ⑤ The parameters are passed to the procedure and the procedure is then executed.

vi) The result is sent back to the client in the same manner.
Now explain what is a socket.

Socket is also a programmatic interface for performing the following functions:
i) of local messaging or prioritizing

Q) What is Application protocols?

Ans: Communication between the hosts
is governed by various protocols. These protocols
or rules, spell out how the participants in
various network processes, should behave. Application
protocol is such a protocol. Application protocols
govern various processes, such as the procedure
for downloading a web page, or for sending
e-mail. The application protocol directs how
these processes are done.

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(b) Describe Domain Name System;

Ans: The domain name system (DNS) works on client server model. It uses UDP protocol for transport layer communication. DNS uses hierarchical domain based naming scheme. The DNS server is configured with fully qualified Domain Names (FQDN) and email addresses mapped with their respective Internet Protocol addresses. A DNS server is requested with FQDN and it responds back with the IP address mapped with it. DNS uses UDP port 53.

QD
② Describe Simple Mail Transfer protocol.

Ans: 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 (User Agents) the user is using. User Agents help the user to type and format the email and store it until internet is available. When an email is submitted to send, the sending process is handled by Message Transfer Agent which is normally comes inbuilt in email client software. Message Transfer agent uses SMTP to forward the email to another Message transfer Agent. Which SMTP is used by end user to only send the emails, the servers normally use SMTP to send as well as receive emails. SMTP uses TCP port number 25 and 587.

client software uses Internet Message Access Protocol (IMAP) or POP protocols to receive emails.

- (d) Describe the file transfer protocol.

Ans:- The File Transfer Protocol (FTP) is the most widely used protocol for file transfer over the network. FTP uses TCP for communication and it works on TCP port 21. FTP works on client/server model where a client requests file from server and server sends requested resource back to the client. FTP uses out-of-band controlling i.e. FTP uses TCP port 20 for exchanging control

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information and the actual data is sent over a TCP port 21. The client requests the server for a file. When the server receives a request for a file, it opens a TCP connection for the client and transfers the file. After the transfer is complete, the server closes the connection. For a second file, client request again and the server response a new TCP connection.

Ques. Explain HTTP protocol and its working.

(a) Describe about Hyper Text Transfer Protocol.

Ans: The Hyper text transfer protocol 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 a 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.

When the server accepts the client request the client is authorized to access web pages. To access the webpages, a client normally uses web browser. Web are

responsible for initiating, maintaining and closing TCP connections. HTTP is a stateless protocol which means the server maintains no information about earlier request by clients.

HTTP versions, best suited for

① HTTP 1.0 uses non persistent HTTP. At most one object can be sent over a single TCP connection.

② HTTP 1.1 uses persistent HTTP. In this version multiple objects can be sent over a single TCP connection.

b) Describe Network services.

Ans:- In computer networking a network service is an application running at the network

application layer and above, that provides data storage, manipulation, presentation, communication or other capability which is often implemented using a client server or peer-to-peer architecture based on application layer network protocols.

Each service is usually provided by a server component running on one or more computers and accessed via a network by client components running on other devices.

However, the client and server components can both be run on the same machine. Client and servers will often have a user interface and sometimes other features associated with it.

Ques. 46.
② Write down about directory services.

Ans: These services are mapping between name and its value, which can be variable value or fixed. This software system helps to store the information, organize it, and provides various means of accessing it.

- ① Accounting: In an organization, a number of users have their user names and passwords mapped to them. Directory Services provides means of storing this information in a cryptic form and makes it available when required.

(ii) Authentication

user credentials are checked to authenticate a user at the time of log in and/or periodically. User accounts can be set into hierarchical structure and their access to resources can be controlled using authorization schemes.

(iii)

Domain Name Service: DNS is widely used and one of the essential services on which internet works. This system maps IP addresses to domain names, which are easier to remember and recall the IP address. Because network operators with the help of IP addresses and humans tend to remember web names. Because the DNS provider maps websites IP addresses which in map its name from the back-end or to its name from the back-end or

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the request of a website name from
the user.

classification of domains been also changing
it can not be said that the same
had been introduced since classification
of this domain has been done by
different set of rules as soon as new
version will be introduced again

Classification of domains based on protocol (IP)

classification based on two basic
categories which are functional and
non-functional or non-functional and a group
of addressable objects and main
in protocol, numbers 91 and 11033
which 91 go to general and 11033
addresses of first group and the
remaining 210 addresses of second