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Q: differentiate between IP and transport protocol with the help of example. (2 Marks)

Answer: - (Page 119)

1-IP provides computer-to-computer communication while TP provide application-to-application communication.

2-IP source and destination addresses are computers while TP need extended addressing mechanisms to identify applications

3-IP is also called machine-to-machine communication while TP are called end-to-end communication.

Q: Give the main advantage and disadvantage of RIP. (2 Marks)

Answer: - [click here for detail](#)

The biggest advantage of RIP is that it is simple to configure and deploy.

The biggest disadvantage of RIP is its inability to scale to large or very large networks. The maximum hop count used by RIP routers is 15. Another disadvantage of RIP is its high recovery time.

Q: Tel the first assignable IP address from a 128.140.80.24/20. (2 Marks)

Answer: - [Click here for detail](#)

The host address range for this subnet is 128.140.80.1 - 128.140.95.254, so the first assignable IP address is 128.140.80.1.

Q: how was the NAT implemented? (2 Marks)

Answer: - (Page 130)

We can see that the old and new values of IP source field and destination field are shown with their directions.

NAT device stores state information in table. The value is entered in the table when NAT box receives outgoing datagram from new.

Q: IS ATM including LAN and WAN network. If yes what kind of connection is established?(2 Marks)

Answer: - (Page 66)

Yes it includes LAN and WAN network and established connection-oriented connection.

Q: is IP multicasting beneficial? Defend your answer with proper reason. (3 Marks)

Answer: - [Click here for detail](#)

We assume that IP multicast is more beneficial for the channels with a high popularity, and therefore these channels will be preferred when the number of available multicast groups is smaller than the number of channels.



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Q: Can the length of the segment be increased 500 meter by adding three repeater one with each segment. It can be done or not. (3 Marks)

Answer: (Page 49)

One repeater doubles, two repeaters triple the maximum cable length limitation. It is to be noted that we cannot increase the maximum cable length as many times as we wish by just adding repeaters.

Q: How an administrator can handle static and dynamic routing. (3 Marks)

Answer: - [Click here for detail](#)

Routing can be handled by a static routing table built by the system administrator. Static tables do not dynamically adjust to changing network conditions, so each change in the table is made manually by the network administrator.

Routing can be handled by a dynamic routing table that responds to changing network condition. Dynamic routing tables are built by routing protocols.

Q: IS TCP/IP suit including ARP. What kind of messages are in ARP. (3 Marks)

Answer: - (Page 97)

The TCP/IP protocol suite includes an Address Resolution Protocol (ARP). The ARP standard defines two basic message types:

- Request
- Response

Q: Traceroute continues to increment the Time To Live until the value is large enough for the datagram to reach its final destination. What happens when the TTL is sufficiently large for the datagram to reach its destination? (3 Marks)

Answer: - [Click here for detail](#)

To learn when a datagram reaches its destination, traceroute sets the UDP destination port number in the datagram to a very large value that the destination host is unlikely to be using. When a host receives a datagram destined to it containing a destination port number that is unused locally, it sends an ICMP port-unreachable error to the source.

Q: describe characteristics of BGP. (5 Marks)

Answer: - (Page 138)

It is most popular Exterior Gateway Protocol in Internet.

It has following characteristics:

"It provides routing among autonomous systems (EGP). "It provides policies to control routes advertised.



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"It uses reliable transport (TCP).

"It gives path of autonomous systems for each destination. "Currently the EGP is of choice in the Internet.

"The current version is four (BGP-4).

"It provides facilities for Transit Routing.

Q: describe IPV6 addressing notation. (5 Marks)

Answer: - (Page 114)

128-bit addresses unwisely in dotted decimal;  
requires 16 numbers:  
105.220.136.100.255.255.255.255.0.0.18.128.140.10  
.255.255

Groups of 16-bit numbers in hex separated by colons - colon hexadecimal  
(or colon hex). 69DC: 8864:FFFF: FFFF: 0:1280:8C0A:FFFF

Zero-compression - series of zeroes indicated  
by two colons FF0C: 0:0:0:0:0:0:B1  
FF0C::B1

IPv6 address with 96 leading zeros is interpreted to hold an IPv4 address.

Q have there is a technique for achieving reliability through TCP. (5 Marks)

Answer: - (Page 123)

Reliability is the responsibility of the Transport layer. In TCP/IP, TCP provides reliable transport service. Most Internet applications use TCP as no other protocol has proved to work better.

### SERVICE PROVIDED BY TCP:

Following are the services provided by TCP:

- Connection-oriented service
- Point-to-point
- Complete reliability
- Full-duplex communication
- Stream interface
- Reliable connection startup
- Graceful connection shutdown



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2. Give reasons for which IPv4 need to be changed? (5 Marks)

**Answer:- (Page 110)**

One of the parameters, which motivated IP for change, is address space. The 32-bit address space allows for over a million networks.

But most networks are class C and too small for many organizations. 214 class B network addresses already almost exhausted (and exhaustion was first predicted to occur, a couple of years ago).

The second parameter is type of service, the IP provides. Different applications have different requirements for delivery reliability and speed. Current IP has type of service that is not often implemented. Another factor for the motivation for change is multicast.

4. How TCP provides reliability? (3 Marks)

**Answer: - (Page 125)**

TCP achieves reliability by retransmission. An acknowledgement is used to verify that data has arrived successfully. If acknowledgement does not arrive, the previous data is retransmitted.

5. How TCP and IP interact with each other? (3 Marks)

**Answer: - (Page 123)**

TCP uses IP to carry messages. TCP message is encapsulated in IP datagram and sent to the destination. On the destination host, IP passes the contents to TCP. It is shown in the figure below.

6. Describe four factors for network classification? (2 Marks)

**Answer: - (Page 4)**

Computer networks are classified by four factors which are as follow:

- 1) BY SIZE:
- 2) BY CONNECTIVITY:
- 3) BY MEDIUM:
- 4) BY MOBILITY:

Q1- What is ICMP and what type of errors internet layer can detect? (5 Marks)

**Answer: - (Page 115)**

Internet control Message Protocol (ICMP) defines error and informational messages. These are given as follows:

1. ERROR MESSAGES:

These are as follows:

- Source quench
- Time exceeded



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- Destination unreachable
- Redirect
- Fragmentation required

Q2- In which situation RIP support for default routers? (5 Marks)

Answer:- [click here for details](#)

RIP, a UDP-based protocol, updates its neighbors, and the neighbors update their neighbors, and so on. Each host that uses RIP has a routing process that sends and receives datagrams on UDP port number 520.

Each RIP router advertises all RIP routes periodically via RIP updates. Each update can contain a maximum of 25 route advertisements. This limit is imposed by RIP specifications. RIP can sometimes be configured to send as many as 255 routes per update. The formats of the RIPv1 and RIPv2 updates are slightly different and are shown below. Additionally, RIPv1 updates are sent to a broadcast address, RIPv2 updates can be either sent to a broadcast or multicast address (224.0.0.9). RIPv2 supports subnet masks, a feature that was not available in RIPv1.

A network address of 0.0.0.0 is considered a default route. A default route is used when it is not convenient to list every possible network in the RIP updates, and when one or more closely-connected gateways in the system are prepared to handle traffic to the networks that are not listed explicitly. These gateways create RIP entries for the address 0.0.0.0, as if it were a network to which they are connected.

Q3- Give Pros and Cons of static and Dynamic routing. (5 Marks)

Answer: - [Click here for detail](#)

### Pros and Cons of Static Routing

- ❖ Static routing is not really a routing protocol. Static routing is simply the process of manually entering routes into a device's routing table via a configuration file that is loaded when the routing device starts up.
- ❖ Static routing is the simplest form of routing, but it is a manual process.
- ❖ Use static routing when you have very few devices to configure (<5) and when you know the routes will probably never change.
- ❖ Static routing also does not handle failures in external networks well because any route that is configured manually must be updated or reconfigured manually to fix or repair any lost connectivity.

### Pros and Cons of Dynamic Routing

Answer: -

- ❖ Dynamic routing protocols are supported by software applications running on the routing device (the router) which dynamically learn network destinations and how to get to them and also advertise those



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- destinations to other routers.
- ❖ A router using dynamic routing will 'learn' the routes to all networks that are directly connected to the device.
  - ❖ Next, the router will learn routes from other routers that run the same routing protocol (RIP, RIP2, EIGRP, OSPF, IS-IS, BGP etc). Each router will then sort through its list of routes and select one or more 'best' routes for each network destination the router knows or has learned.
  - ❖ Dynamic routing protocols have the ability to adapt to logical network topology changes, equipment failures or network outages 'on the fly'.

Q4- How ICMP used to test different tools? (3 Marks)

Answer:- (Page 117)

ICMP can also be used to test different tools. An Internet host A, is reachable from another host B, if datagrams can be delivered from A to B. Ping program tests reach ability. It sends datagram from B to A that echoes back to B. It uses ICMP echo request and echo reply messages. Internet layer includes code to reply to incoming ICMP echo request messages.

Q5 - How does host join and leave a group? (3 Marks)

Answer:- (Page 142)

A standard protocol exists that allows a host to inform a nearby router whenever the host needs to join or leave a particular multicast group known as Internet Group Multicast Protocol (IGMP). The computer uses IGMP to inform the local router about the last application when it leaves.

Q6- When packet lost what is the procedure TCP adopt? (3 Marks)

Answer:- [Click here for detail](#)

When a retransmitted TCP packet is lost (i.e., retransmission fails) most implementations do not have a mechanism to recover the packet without waiting for a retransmission time out and subsequent Slow Start. packet is lost for any reason, TCP adopts a sliding window approach, that is the sender keeps sending a few other packets even if it has not received the ACK for the missing packet, in case the lost packet will arrive out of order

Q7- In this subnet blocks 192.168.1.0/26 What is the range of assignable host address?

(3 Marks)

Answer:- [click here for details](#)

Block size is 64.  $1\text{NID} + 1\text{BID} + 62 = 64$ , so assignable host address are 62, and subnet mask is



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255.255.255.192

Q8 - Write the difference between Explicit and implicit frame type. (3 Marks)

Answer: - (Page 35)

In EXPLICIT FRAME TYPE the identifying value is included with frame describes types of included data while in implicit frame the receiver must infer from frame data.

Q9 - Give the concept of zero compression regarding IPV6. (2 Marks)

Answer: - (Page 114)

Zero-compression - series of zeroes indicated by two colons

FF0C: 0:0:0:0:0:0:B1

FF0C::B1

Q10 - Which technique is used for insertion and deletion in routing table. (2 Marks)

Answer: -

The search, insertion, and deletion operations can be finished in  $O(\log N)$  time, where N is the number of prefixes in a routing table.

Q11- Can multiple IP addresses assigned or not on different interfaces of a router. (2 Marks)

Answer: - [Click here for detail](#)

You cannot have two different IP addresses from the same network assigned to the router.

Q12- In which process backward compatibility of 100-base- T is done? (2 Marks)

Answer: (Page 47)

100Base-T technology is backward compatible and allows the participants to negotiate a speed when connection is established. This process is known as auto negotiation.

Q13- Does OSPF only share information with an area or does it allow communication between different areas? (2 Marks)

Answer:- (Page 141)

OSPF allows subdivision of Autonomous System into areas. The link-status information is propagated within an area. The routes are summarized before being propagated to another area.

What is the role of area in open shortest path first (OSPF)? (5 Marks)

Answer:- (Page 141)

OSPF allows subdivision of Autonomous System into areas. The link-status information is propagated within an area. The routes are summarized before being propagated to another





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area. It reduces overhead (less broadcast traffic). Because it allows a manager to partition the routers and networks in an autonomous system into multiple areas, OSPF can scale to handle a larger number of routers than other IGPs.

Compare IPv6 with IPv4. **(5 Marks)**

Answer: [click here for detail](#)

**IPV4**

32 bits long (4 bytes).

Unicast, multicast, and broadcast.

You must configure a newly installed system before it can communicate with other systems Variable length of 20-60 bytes, depending on IP options present.

iSeries Navigator provides a complete configuration solution for TCP/IP.

RIP is a routing protocol supported by the routed daemon.

**IPV6**

128 bits long (16 bytes)

Unicast, multicast, and anycast.

Configuration is optional, depending on functions required.

Fixed length of 40 bytes. There are no IP header options

Same for IPV6 Currently, RIP does not support IPv6. IPv6 routing uses static routes.

Transit routing. **(3 Marks)**

Answer: [Click here for detail](#)

A routing transit number (RTN) is a nine digit bank code, This code was designed to facilitate the sorting, bundling, and shipment of paper checks back to the drawer's (check writer's) account.

Are TCP/IP protocols organized into conceptual layers?

Answer:- [click here for details](#)

TCP/IP is organized into four conceptual layers.

**Network Interface Layer**

The network interface layer is the lowest level of the TCP/IP protocol stack. It is responsible for transmitting datagrams over the physical medium to their final destinations.

**Internet Layer**

The Internet layer is the second level of the TCP/IP protocol stack. It provides host-to-host communication. In this layer, packets are encapsulated into datagrams, routing algorithms are run, and the datagram is passed to the network interface layer for transmission on the attached network.

**Transport Layer**

The transport layer is the third level of the TCP/IP protocol stack. It is responsible for providing communication between applications residing in different hosts. By placing identifying information in





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the datagram (such as socket information), the transport layer enables process-to-process communication.

The transport layer provides either a reliable transport service (TCP) or an unreliable service (User Data Protocol). In a reliable delivery service, the destination station acknowledges the receipt of a datagram.

**Application Layer**

The application layer is the fourth and highest level of the TCP/IP protocol stack. Some applications that run in this layer are:

- Telnet
- File Transfer Protocol (FTP)
- Simple Mail Transfer Protocol (SMTP)
- Simple Network Management Protocol (SNMP)
- Domain Name System (DNS)

What is the size of the datagram header? (3 Marks)

Answer: (Page 102)

Datagram's can have different sizes i.e.

Header area is usually fixed (20 octets) but can have options. Data area can contain between 1 octet and 65.535 octets (2<sup>16</sup>-1). Usually, data area is much larger than header

Can the length of an Ethernet be increased by adding a repeater? (3 Marks)

Answer: (Page 49)

One repeater doubles, two repeaters triple the maximum cable length limitation. It is to be noted that we cannot increase the maximum cable length as many times as we wish by just adding repeaters.

What is meant by client and server? (2 Marks)

Answer:- (Page 145)

It is used by all network applications. The passive program is called a server and the active program is called a client.

1) Is bridge is intelligent? (2 Marks)

Answer:-

Yes, bridge is intelligent.

2) What is meant by Zero Compression in IPv6? (2 Marks)

Answer:- (Page 114)

Zero-compression - series of zeroes



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indicated by two colons FF0C:

0:0:0:0:0:B1

FF0C::B1

IPv6 address with 96 leading zeros is interpreted to hold an IPv4 address.

3) Why three-way handshake technique is used by TCP? (3 Marks)

Answer:- (Page 127)

Part of the 3-way handshake used to create a connection, requires each end to generate a random 32-bit sequence number. If an application attempts to establish a new TCP connection after a computer reboots, TCP chooses a new random number.

6) Why we need server? (3 Marks)

Answer:- (Page 146)

- ❖ "It can handle multiple remote clients simultaneously.
- ❖ "It invoked automatically when system boots.
- ❖ "It executes forever.
- ❖ "It needs powerful computer and operating system.
- ❖ "It waits for client contact.
- ❖ "It accepts requests from arbitrary clients.

7) Difference b/w PIM-SM and PIM-DM (5 Marks)

Answer:- (Page 144)

**PROTOCOL INDEPENDENT MULTICAST \_ SPARSE MODE (PIM-SM):**

This is a protocol that uses the same approach as CBT to form a multicast routing tree. The designers chose the term protocol independent to emphasize that although unicast datagrams are used to contact remote destinations when establishing multicast forwarding. PIM-SM does not depend on any particular unicast routing protocol.

**PROTOCOL INDEPENDENT MULTICAST \_ DENSE MODE (PIM-DM):**

A protocol designed for use within an organization. Routers that use PIM-DM broadcast (i.e. flood) multicast packets to all locations within the organization. Each router that has no member of a particular group sends back a message to prune the multicast routing tree ((i.e., a request to stop the flow of packets). The scheme works well for short-lived multicast sessions (e.g., a few minutes) because it does not require setup before transmission begins.

8) Describe NAT using at Home. (5 Marks)

Answer:- (Page 132)

NAT is useful at a residence with Cable Modem or DSL connectivity as it allows the customer



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to have multiple computers at home without requiring an IP address for each of them. Instead a single IP address is used for all the computers. NAT software allows a PC to connect with the Internet and act as a NAT device at the same time. It is shown in the figure below where multiple computers are connected to the dedicated hardware device implementing NAT.

Why EGP not use routing metric??(5)

Answer:- [Click here for detail](#)

Although EGP is a dynamic routing protocol, it uses a very simple design. It does not use metrics and therefore cannot make true intelligent routing decisions. EGP routing updates contain network reachability information.

In other words, they specify that certain networks are reachable through certain routers. Because of its limitations with regard to today's complex internetworks, EGP is being phased out in favor of routing protocols such as BGP.

How congestion control by tcp?(5)

Answer:- [Click here for detail](#)

When a TCP connection first begins, the Slow Start algorithm initializes a congestion window to one segment, which is the maximum segment size (MSS) initialized by the receiver during the connection establishment phase. When acknowledgements are returned by the receiver, the congestion window increases by one segment for each acknowledgement returned. Thus, the sender can transmit the minimum of the congestion window and the advertised window of the receiver, which is simply called the transmission window.

IPv6 addressing (5)

Answer:- [\(Page 114\)](#)

IPv6 uses 128-bit addresses. A 128-bit address includes network prefix and host suffix. An advantage of IPv6 addressing is that it has no address classes i.e. prefix/suffix boundary can fall anywhere.

Following are special types of addresses, IPv6 uses:

Unicast: It is used for single destination computer.

Multicast: It is used for multiple destinations; possibly not at same site.

Cluster: This type of address is used for collection of computers with same prefix; datagram is delivered to one out of cluster.

Define jitter (2)

Answer:- [\(Page 66\)](#)

Jitter is the term used for variance in transmission delays.

Jitter is significance for voice, video and data. In LANs, jitter can occur when a packet is



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delayed because the network is busy.

Define TCP(2)

**Answer:-**

TCP (Transmission Control Protocol) is a set of rules (protocol) used along with the Internet Protocol (IP) to send data in the form of message units between computers over the Internet.

What is meant by the client server paradigm ?(2)

**Answer:- (Page 145)**

It is used by all network applications. The passive program is called a server and the active program is called a client.

How receiver knows incoming frame is id datagram (2)

**Answer: (Page )**

The sender and receiver must agree on the value used in the frame type field of the frame header in order to know the incoming frame contains an IP datagram.

Why organization does not use single router(3)

**Answer: (Page 82)**

Organization seldom uses a single router to connect its entire network for two reasons.

- Because the router must forward each packet, the processor in a given router is insufficient to handle the traffic.
- Redundancy improved Internet reliability.

Distance Vector Routing (2 Marks)

**Answer:- (Page 63)**

Local information is next hop routing table and distance from each switch. The switches periodically broadcast topology information i.e. destination, distance. Other switches update routing table based on received information.

What stand for MTU, define (2 Marks)

**Answer:- (Page 107)**

Every hardware technology specification includes the definition of the maximum size of the frame data area, which is called the Maximum Transmission Unit (MTU).



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Why the Internet Multicast Routing is difficult (2 Marks)

Answer:- (Page 142)

Internet multicast routing is difficult because internet multicast allows arbitrary computer to join multicast group at any time. It allows arbitrary member to leave multicast group at any time.

What the basic function of Twice NAT? (2 Marks)

Answer:- (Page 131)

Twice NAT is another variant of NAT. It is used with site that runs server. In this process NAT box is connected to Domain Name.

Difference between Static and Dynamic Routing (3 Marks)

Answer:- (Page 133)

**STATIC ROUTING:**

It is one of the forms of Internet routing. In Static routing, the table is initialized when system boots and there is no further changes.

**DYNAMIC ROUTING:**

In dynamic routing the table is initialized when system boots. It includes routing software which learns routes and updates table. In this way continuous changes are possible due to routing software.

What is data stuffing (3 Marks)

Answer:- (Page 17)

In general to distinguish between data being sent and control information such as frame delimiters network

systems arrange for the sending side to change the data slightly before it is sent because systems usually insert data or bytes to change data for transmission, the technique is known as Data Stuffing.

Message Oriented in UDP (5 Marks)

Answer:- (Page 120)

UDP offers application programs a Message-Oriented Interface. It does not divide messages into packets for transmission and does not combine messages for delivery.

Let's discuss its advantages and disadvantages.

**ADVANTAGES:**

- Applications can depend on protocol to preserve data boundaries.



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### **DISADVANTAGES:**

- Each UDP message must fit into a single IP datagram.
- It can result to an inefficient use of the underlying network.

What is Base Header in IPv6? (5 Marks)

[Answer:- \(Page 112\)](#)

Base header is fixed size i.e. 40 octets. NEXT HEADER field in the base header defines type of header and it appears at end of fixed-size base header. Some extension headers are variable sized. NEXT HEADER field in extension header defines type.

What is simple duplex and full duplex? (2 Marks)

[Answer:- \(Page 76\)](#)

Some connection-oriented technologies provide full duplex while other allow on simplex connection. To communicate using a simplex design a pair of computers must establish two connections one from computer A to computer B and another from computer B to A.

What is means by "It provides facilities for Transit Routing."? (2 Marks)

[Answer:- Click here for Detail](#)

Facilities For Transit Routing classifies each AS as a transit system if it agrees to pass traffic through, or as a stub system if it does not BGP allows a corporation to classify itself as a stub even if it is multi-homed (refuse to accept transit traffic)

Does OSPF support for multi access network? (2 Marks)

[Answer:- \(Page 140\)](#)

Yes, OSPF supports for multi access network.

What is difference in NIC and CPU Processing? (3 Marks)

[Answer:- \(Page 40\)](#)

NIC contains sufficient hardware to process data independent of system CPU. In which some NICs contain separate microprocessor. In addition to this it also include analog circuitry interface to system bus, buffering and processing.

What is Extension Header in Ipv6? (3 Marks)

[Answer:- \(Page 111\)](#)

Additional information is stored in optional extension headers, followed by data.

How long TCP Should wait before retransmitting? (3 Marks)

[Answer:- \(Page 125\)](#)



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The time for acknowledgement to arrive depends on:

- Distance to destination
- Current traffic conditions

Multiple connections can be opened simultaneously. Traffic conditions change rapidly.

What is congestion control, How TCP Segment format is done? (3 Marks)

[Answer: \(Page 128\)](#)

**Congestion control**

The goal of congestion control is to avoid adding retransmissions to an already congested network. Reducing the window size quickly in response to the lost messages does it. It is assumed that loss is due to congestion.

**TCP Segment format**

TCP uses single format for all messages. TCP uses the term segment to refer to a message. Each message sent from TCP on one machine to TCP on another machine uses this format including data and acknowledgement.

Question no. 31 (2 Marks)

Find the class in 00000001.001011.1001.111

[Answer: \(Page 87\)](#)

Class A

Question no. 32 (2 Marks)

What is the difference between unicast and multicast?

[Answer:- \(Page 114\)](#)

Unicast is used for single destination computer while multicast is used for multiple destinations

Question no. 34 (2 Marks)

What is the role of DMA in NIC?

[Answer:- \(Page 34\)](#)

It may use DMA to copy frame data directly from main memory and copy data directly into main memory.

Question no. 35 (2 Marks)

What is the function of Hop count matrix in routing information protocol?

[Answer:- Click here for detail](#)

RIP uses a hop count metric to measure the distance to a destination





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Question no. 36 (Marks2)

What is the scale or level of requirement in of IPv6?

[Answer:- \(Page 110\)](#)

Scale is also dramatically changed. Size from a few tens to a few tens of millions of computers has been revolutionized. Speed has increased from 56Kbps to 1Gbps. Also there is an increased frame size in hardware.

Question No: 37 (3 Marks)

Change the following into  
equivalent binary

154.31.161.13

202.32.15.7

192.168.1.5

[Answer: \(Page \)](#)

154.31.161.13

Binary: 10011010 00011111 10100001 00001101

202.32.15.7

Binary: 11001010 00100000 00001111 00000111

192.168.1.5

Binary: 11000000 10101000 00000001 00000101

Question No: 38 (3 Marks)

What is the meaning of Facilities for Transit Routing as a characteristic of the Border Gateway Protocol?

[Answer:- Click here for Detail](#)

Facilities For Transit Routing classifies each AS as a transit system if it agrees to pass traffic through, or as a stub system if it does not BGP allows a corporation to classify itself as a stub even if it is multi-homed (refuse to accept transit traffic)

Question No: 40 (3 Marks)

Name the six services provided by TCP

[Answer:- \(Page 123\)](#)

Following are the services provided by TCP:

- Connection-oriented service
- Point-to-point
- Complete reliability



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- Full-duplex communication
- Stream interface
- Reliable connection startup
- Graceful connection shutdown

Question No: 42 (3 Marks)

What are the distance limitations in Fiber Optic?

[Answer: Page 48](#)

Optical fiber can extend across several kilometers because delays on optical fiber are very low and bandwidth is very high.

Question No: 43 (5 Marks)

What are the three approaches for datagram forwarding?

[Answer:- \(Page 143\)](#)

FLOOD-AND-PRUNE  
CONFIGURATION-  
AND-TUNNELING  
CORE-BASED  
DISCOVERY

Question No: 45 (5 Marks)

Write down the comparison of Distance- vector and Link - state algorithm?

[Answer: \(Page 64 \)](#)

COMPARISON:

DISTANCE-VECTOR ROUTING:

- It is very simple to implement.
- Packet switch updates its own routing table first.
- It is used in RIP.

LINK-STATE ALGORITHM:

- It is much more complex.
- Switches perform independent computations.
- It is used in OSPF.

What are the functions that the IP multicast abstraction allows an application running on an arbitrary computer to do? (2 Marks)

[Answer: \(Page 142\)](#)

It also allows arbitrary computer to send message to a group (even if not a member).



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What is the functionality of address resolution software in layering? (2 Marks)

[Answer:- \(Page 100\)](#)

Address resolution software hides ugly details and allows generality in upper layers.

Why we need the variants of NAT? Explain it with the proper reasons? (2 Marks)

[Answer:- \(Page 131\)](#)

Variants of NAT

The basic NAT simply changes IP addresses. But Network Address and Port Translation (NAPT) (which is another modified form of NAT) changes IP addresses and protocol port numbers too. It is the most popular form of NAT.

Twice NAT is another variant of NAT. it is used with site that runs server. In this process NAT box is connected to Domain Name.

What are some of the metrics used by routing protocols? (3 Marks)

[Answer:- click here for detail](#)

2 types of metrics used by routing protocols are:

- Hop count-this is the number of routers a packet must travel through to get to its destination
- Bandwidth-this is the “speed” of a link also known as the data capacity of a link.

ABC industry is using different network technologies in its branches. Can all branches communicate with each other? If No, then give reason? [3]

[Answer: \(Page \)](#)

Despite the incompatibilities among networks, researchers have devised a scheme that provides universal service among heterogeneous networks called ‘internetworking’.

It uses both hardware and software.

A router is a special purpose system dedicated to the task of interconnecting networks. A router can interconnect networks that use different technologies including different media, physical addressing schemes or frame formats.

Which type of NAT fails if an application uses the IP addresses instead of domain name? And why? (3 Marks)

[Answer:- \(Page 132\)](#)

Twice NAT fails if an application uses the IP addresses instead of Domain Name. Because Basic NAT does not work well for communication initiated from the Internet. Twice NAT allows a site to run servers. It requires the DNS to interact with the NAT device.



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Network engineer has three address resolution methods. How many methods does TCP/IP support in a real environment? Write names of methods and support your answer with solid reason? (5 Marks)

**Answer:-**

Address resolution algorithms can be grouped into three basic categories:

- Table lookup
- Closed-form computation
- Message Exchange

TCP/IP can use any of the three address resolution methods depending on the addressing scheme used by the underlying hardware.

What is the difference between an interior gateway protocol and an exterior gateway protocol? Name an example of each. (5 Marks)

**Answer:- (Page 135)**

INTERIOR GATEWAY PROTOCOLS (IGPs):

It is used among routers within autonomous system. The destinations lie within IGP. EXTERIOR GATEWAY PROTOCOLS (EGPs):

It is used among autonomous systems. The destinations lie throughout Internet

As the Internet grew, the original Classful addressing scheme became a limitation, what is the designed solution. (5 Marks)

**Answer:- (Page 90)**

As the Internet grew, the original Classful addressing scheme became a limitation. The IP address space was being exhausted because all networks had to choose one of three possible sizes. Many addresses were unused. Two new mechanisms were invented to overcome the limitations, which are as follows:

- Subnet addressing
- Classless addressing

Instead of having three distinct address classes, allow the division between prefix and suffix to occur on an arbitrary boundary. The classless addressing scheme solves the problem by allowing an ISP to assign a prefix that is, 28 bits long (allowing the host to have up to 14 hosts).

How can a datagram be transmitted across a physical network that does not understand the datagram format? (2 Marks)

**Answer:- [Click here for detail](#)**

When an IP datagram is encapsulated in a frame, the entire datagram is placed in the data area of a frame.

Describe the process of routing packets (2 Marks)

**Answer:- [Click here for detail](#)**

Routing is the act of moving information across an internet work from a source to a destination.



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How ICMP can be used to trace a route? (2 Marks)

Answer:- (Page 118)

There are two possibilities used to detect the destination.

- ❖ Send an ICMP echo request, destination host will generate an ICMP echo reply.
- ❖ Send a datagram to a non-existent application, destination host will generate an ICMP unreachable message.

1: Limitations of parity checking? (2 mark)

Answer:- (Page 19)

Parity can only detect errors that change in odd number of bits for example the original data and parity is 10010001+1 (even parity) and the incorrect data is 10110011+1 (even parity). We see that even no. of bits have been changed due to noise so parity checking can not detect this error. Parity usually is used to detect on bit error.

2: how can we prove that we have 2,147,483,648 addresses in class A.? (2 mark)

Answer:- [Click here for detail](#)

In class A, only 1 bit defines the class. The remaining 31 bits are available for the address. With 31 bits, we can have  $2^{31}$  or 2,147,483,648 addresses

5: where should an ICMP message be sent? (2 mark)

Answer:- (Page 117)

ICMP message is sent in response to incoming datagrams with problems. ICMP message is not sent for ICMP message.

8: How can switch virtual network be established? (3 Marks)

Answer:- (Page 70)

Each pair of switches in the path communicates to choose a VPI/VCI for their tables. Once the connection is established by the destination, a message is sent back to the originating computer to indicate the SVC is ready. If any switch or the destination computer does not agree to setting up the VC, an error message is sent back and the SVC is not established.



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9: Could IP be redesigned to use hardware addresses instead of the 32-bit addresses it currently uses. Why or why not? (3 Marks)

Answer:- [Click here for detail](#)

No, IP is not redesigned to use hardware addresses instead of 32-bit addresses

- IP addresses must have a hierarchical format so, it supports the hierarchical routing
- Hardware addresses such as the 48-bit Ethernet addresses are chosen from a flat address space and have no provision for a “network address” to be used for Internet routing.

10: Three features of dynamic message method in ARP. (3 Marks)

Answer:- (Page 97)

**ADDRESS RESOLUTION WITH MESSAGE EXCHANGE:**

A computer that needs to resolve an address sends a message across a network and receives a reply. The message carries a request that specifies the protocol address and reply carries the corresponding hardware address.

In this category there are two possible designs:

- Centralized
- Distributed

**CENTRALIZED:**

A network includes one or more servers that are assigned the task of answering address resolution requests. **It has an advantage that resolution is easier to configure, manage and control.**

**DISTRIBUTED:**

Each computer on the network participates in address resolution by agreeing to answer resolution request for its address. It also has an advantage that address resolution servers can become a bottleneck and reduce cost.

12: why TCP is called end to end protocol? (3 Marks)

Answer:- (Page 123)

It provides application-to-application communication.

Applications can request a connection. TCP connections are called Virtual Connections. They are created by software only. Internet does not provide software or hardware support for the connections. TCP software modules on two computers create an illusion of a connection.

Question No: 32 ( Marks: 2 )

Define what is extension head in IPv6

Answer:- (Page 111)

Additional information is stored in optional extension headers, followed by data.



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Question No: 34 ( Marks: 2 )

Which wireless standard is used in WIFI technology?

Answer:- (Page 29)

IEEE 802.11

Question No: 36 ( Marks: 3 )

Write a note on “limited connectivity” of Wireless LAN.

Answer:- (Page 29)

In contrast with wired LANs, not all participants may be able to reach each other

Because:

- ❖ It has low signal strength.
- ❖ In wireless LANs the propagation is blocked by walls etc.
- ❖ It can't depend on CD to avoid interference because not all participants may hear.

Question No: 39 ( Marks: 5 )

What is meant by message oriented interface in UDP also give the advantages and disadvantages of interface

Answer:- (Page 120)

UDP offers application programs a Message-Oriented Interface. It does not divide messages into packets for transmission and does not combine messages for delivery. Let's discuss its advantages and disadvantages.

**ADVANTAGES:**

- Applications can depend on protocol to preserve data boundaries.

**DISADVANTAGES:**

- Each UDP message must fit into a single IP datagram.
- It can result to an inefficient use of the underlying network

Question No: 54 (Marks: 3)

How does IP software reassemble fragments that arrive out of order?

Answer:- (CS610 ref.Book Page 323)

When a packet is fragmented, the fragments must be numbered in such a way that the original data stream can be reconstructed. One way of numbering the fragments is to use a tree. If packet 0 must be split up, the pieces are called 0.0, 0.1, 0.2, etc. If these fragments themselves must be fragmented later on, the pieces are numbered 0.0.0, 0.0.1, 0.0.2. . . 0.1.0, 0.1.1, 0.1.2, etc. If enough fields have been reserved in the header for the worst case and no duplicates are generated anywhere, this scheme is sufficient to ensure that all the pieces can be correctly reassembled at the destination, no matter what order they arrive in.





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Question No: 55 (Marks: 3)

What is the first address in the block if one of the addresses is 167.199.170.82/27?

Answer:- [Click here for detail](#)

Address in binary: 101001111100011110101

01001010010

Keep the left 27 bits: 10100111110001111010

101001000000      Result      in      CIDR

notation: 167.199.170.64/27

Question No: 58 (Marks: 5)

Write a note on Address Resolution.

Answer:- (Page 93)

Mapping between a protocol address and a hardware address is called Address Resolution. A host or router uses address resolution when it needs to send a packet to another computer on the same physical network. A

computer never resolves the address of a computer that attaches to a remote network.

In the figure below a simple Internet with routers R1 & R2 connecting three physical networks is shown each network has two host computers attached.

Question No: 21 ( Marks: 2 )

Is there a comparison between TCP/IP reference model and ISO reference model?

Answer:- [Click here for detail](#)

The main differences between the two models are as follows:

TCP/IP combines the presentation and session layer issues into its application layer.

TCP/IP combines the OSI data link and physical layers into the network access layer.

TCP/IP appears to be a simpler model and this is mainly due to the fact that it has fewer layers.

Question No: 25 ( Marks: 3 )

What is the first address in the block if one of the addresses is

140.120.84.24/20?

Answer:-

The first address is 140.120.80.0/20

Question No: 26 ( Marks: 3 )

Write three new features of IPV6.

Answer:- (Page 111)

- IPV6 addresses are 128 bits.
- Header format is entirely different.
- Additional information is stored in optional extension headers, followed by data.
- Flow label and quality of service allows audio and video applications to establish appropriate



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connections.

- New features can be added more easily. So it is extensible.

Question No: 30 ( Marks: 10 )

LIST SOME CHARACTERISTICS OF A CLIENT.

[Answer:- \(Page 145\)](#)

CHARACTERISTICS OF A CLIENT:

The characteristics of a client are explained below:

- ❖ "Client is an arbitrary application program.
- ❖ "It becomes client temporarily.
- ❖ "It can also perform other computations.
- ❖ "It is invoked directly by the user.
- ❖ "It runs locally on the user's computer.
- ❖ "It actively initiates contact with a server.
- ❖ "It contacts one server at a time.

Question No: 24 ( Marks:3)

What format is used for an internet packet?

[Answer:- \(CS610 ref.Book Page 37\)](#)

The internet layer defines an official packet format and protocol called IP (Internet Protocol). The job of the internet layer is to deliver IP packets where they are supposed to go.

Question No: 25 ( Marks:3)

“To achieve a hierarchy, OSPF allows an autonomous system to be partitioned for routing purposes”. Does this feature make OSPF more complex or powerful?

[Answer:- Click here for detail](#)

OSPF allows an autonomous system to be partitioned for routing purposes which make it complex but More powerful.

Question No: 26 ( Marks:3)

Why does IPv6 use separate Extension Headers?

[Answer:- \(Page 113\)](#)

IPv6 use separate Extension Headers. Fragmentation information is kept in separate extension



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header. Each fragment has base header and (inserted) fragmentation header. Entire datagram including original header may be fragmented.

Question No: 27 ( Marks:5)

Consider the IP addresses: 178.200.127.5 and the corresponding subnet masks 255.255.255.0, then find out the following:

- a. The number of bits used for subnetting
- b. Total number of host in the subnet
- c. The network address of the subnet
- d. The subnet address of the IP address.

**Answer:-** [Click here for detail](#)

a. The number of bits used for subnetting  
**8 bits**

b. Total number of host in the subnet  
**254**

c. The network address of the subnet.  
**178.200.127.0**

Question No: 29 (Marks:5)

Write down the comparison of Distance- vector and Link - state algorithm?

**Answer:-** [\(Page 64\)](#)

**COMPARISON:**

**DISTANCE-VECTOR ROUTING:**

- It is very simple to implement.
- Packet switch updates its own routing table first.
- It is used in RIP.

**LINK-STATE ALGORITHM:**

- It is much more complex.
- Switches perform independent computations.
- It is used in OSPF.

Question No: 30 ( Marks:10)

Describe in detail what is the purpose of the following table? What sort of information can be extracted?

First Four Bits Of address	Table index in decimal	Class of Address
-------------------------------	---------------------------	------------------



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0000	0	A
0001	1	A
0010	2	A
0011	3	A
0100	4	A
0101	5	A
0110	6	A
0111	7	A
1000	8	B
1001	9	B
1010	10	B
1011	11	B
1100	12	C
1101	13	C
1110	14	D
1111	15	E

**Answer:- (Page 87)**

Whenever it handles a packet, IP software needs to separate the destination address into a prefix and suffix. Classful IP addresses are self-identifying because the class of the address can be computed from the address itself. The table shows in the figure above how the class of address can be computed.

**Question No: 31 (Marks: 10)**

List down and describe at least five characteristics of Routing Information Protocol.

**Answer:- (Page 138)**

**ROUTING INFORMATION PROTOCOL (RIP):**

It has the following characteristics:

"It is used for routing within an autonomous system (IGP). "It uses UDP for all message transmissions.

"It can be used to advertise default route propagation. An organization can use RIP to install a default route in each router.

"It uses distance vector algorithm.

"RIP allows hosts to listen passively and update its routing table.

**Question: Is TCP/IP suit including ARP? What kind of messages are in ARP.**

**Answer:- (Page 97)**

The TCP/IP protocol suite includes an Address Resolution Protocol (ARP). The ARP standard defines two basic message types:

Request ,Response



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**Is bridge an intelligent device? IF yes then how.**

**OR .....How can we say that the bridge is an intelligent device? Give two reasons.**

**Answer:-**

Yes, bridge is intelligent device. A bridge is a hardware device also used to connect two LAN segments to extend a LAN. Unlike a repeater, a bridge uses two NICs to connect two segments. It listens to all traffic and recognizes frame format. It also forwards only correct complete frames and discards the collided and error frames.

A typical bridge has two NICs, a CPU a memory and a ROM. It only runs the code stored in its ROM.

**What are the services provided by TCP?**

**Answer:-**

Following are the services provided by TCP:

- Connection-oriented service
- Point-to-point
- Complete reliability
- Full-duplex communication
- Stream interface
- Reliable connection startup
- Graceful connection shutdown

**Network administrator wants to get periodic updates of routing tables. Which routing algorithm would be used there, Give reason**

**Answer:-**

**DISTRIBUTED ROUTE COMPUTATION:**

Each packet switch computes its routing table locally and sends messages to the neighbors. It also updates information periodically. If a link or a packet switch fails then the network adapts its failure. The packet switch then modifies the tables to avoid failed hardware.

**Host B send some IP datagram's to Host F. HOW does host F machine identify the entire original datagram? Support your answer with solid reason**

**Answer:-**

Each fragment is an independent datagram. It includes all header fields. Bit in header indicates that the datagram is a fragment. Other fields have information for reconstructing original datagram. Fragment offset gives original location of fragment.

Reconstruction of original datagram is called reassembly. Ultimate destination performs reassembly



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**Which has responsibility for the propagation of multicast routing? Explain it with help of example**

**Answer:-**

Routers not hosts have responsibility for the propagation of multicast routing information. The size and topology of groups may vary e.g. Teleconferencing often creates small groups and on the other side web casting can create a large group.

**If we send a frame from one machine to another machine, what kind of data is being inside the frame and how can receiver know it?**

**Answer:-**

**IDENTIFYING PACKET CONTENTS:**

The destination must get some clue about how to interpret frame data. For this purpose it can use two types which are given as follows.

**EXPLICIT FRAME TYPE:**

In this type the identifying value is included with frame describes types of included data.

**IMPLICIT FRAME TYPE:**

In implicit frame the receiver must infer from frame data.

**HEADERS AND FRAME FORMAT:**

LAN technology standards define frame format for each technology. All contemporary standards use the following general format.

a) Frame header b) payload

Frame header has address and other identifying information.

Information typically in fields has fixed size and location. The data area may vary in size.

**Network administrator's system receives some fragments of IP datagram. How does IP software reassemble fragments that arrive out of order?**

**Answer:-**

Reconstruction of original datagram is called reassembly. Ultimate destination performs reassembly. Fragments may arrive out of order. Header bit identifies fragments containing end of data from original datagram.

IDENT field in each fragment matches IDENT field in original datagram. Fragments from different datagrams can arrive out of order and still be sorted out.



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**Why server is needed, Defend your answer with the help of example.**

**Answer:-**

The passive program is called a server and the active program is called a client. Servers are basically computers dedicated to serving out files. They are required in order to distribute the information, without them you couldn't retrieve information. Websites and other online things are stored on servers which are then fed out to people who require these things. Servers are a vital thing for information sharing. Servers are also used in organisations as a central data point where files can be stored.

**How many methods are available to span a bridge network over long distances? Just write their names**

**Answer:-**

There are two common methods to connect two distant sites

LEASED SERIAL LINE CONNECTION: Which is less distant.

LEASED SATELLITE CHANNEL: It can span arbitrarily long distance.

**Network engineer wants to implement an ARP technique in which protocol addresses must be independent from hardware addresses. Write the name of technique**

**Answer:-**

**IP: INTERNET PROTOCOL ADDRESSES**

Although IP addresses are hardware-independent, hardware addresses must still be used to actually transport data across a network's link layer. ARP, the Address Resolution Protocol, discovers the hardware address associated with a particular IP address. It can be used on any kind of network that supports broadcasting but is most commonly described in terms of Ethernet.

If host A wants to send a packet to host B on the same Ethernet, it uses ARP to discover B's hardware address. If B is not on the same network as A, host A uses the routing system to determine the next-hop router along the route to B and then uses ARP to find that router's hardware address. Since ARP uses broadcast.





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**Which type of NAT fails when an application uses the IP address instead of domain name?**

**Answer:-**

TWICE NAT

**Which gateway protocol is mostly used as EGP? List its two properties**

**Answer:-**

**BORDER GATEWAY PROTOCOL:**

It is most popular Exterior Gateway Protocol in Internet. It has following characteristics:

"It provides routing among autonomous systems (EGP).

"It provides policies to control routes advertised.

"It uses reliable transport (TCP).

"It gives path of autonomous systems for each destination.

"Currently the EGP is of choice in the Internet.

"The current version is four (BGP-4).

"It provides facilities for Transit Routing.

**What is the purpose of inserting extra characters between two frames? Which problems can occurs with it? List any two problems**

**Answer:-**

To avoid the no delay between two frames each frame sends an extra character between block of data. In practice there is a disadvantage of overhead.

**Internet layer receives and sends packets for the network. It contains the powerful protocols like IP, .ARP and ICPM. Which types of errors internet layer can detect? Just enlist any three names.**

**Answer:-**

IP Internet layer has following tasks:

- It constructs datagram, determines next hop and hands to network interface layer.

Internet layer can detect a variety of errors: e.g.

- Checksum (header only)
- TTL expires
- No route to destination network.



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- Can't deliver to destination host (e.g., no ARP reply).

Internet layer discards datagrams with problems. Some - for example, checksum error – can't trigger error messages.

**Suppose a medical firm wants to attain point to point communication in its computer network. Considering this scenario, discuss at least 5 disadvantages of it.**

**Answer:-**

The point-point network is impractical from a networking standpoint because rarely is only one connection between two nodes adequate. The point-to-point network can be compared to two soup cans connected by a string. Although there is nothing to interrupt the connection, there is no ability for the network to branch out and make more connections.

A good example of a point-to-point network is a computer that is connected to a local printer by a USB cable. Although highly reliable, there is no way for either node to connect to anything else using that one USB connection. Also, without any redundancy, the entire connection is dependent on the USB cable as well.

There is a variety of network types besides the point-to-point architecture. Although the simplest, point-to-point networks do not enjoy redundancy they do enjoy not having to rely on the functionality of other nodes to make a connection. Choosing the right network architecture is a matter of assessing the need for redundancy and the effect of having two or more connections dependent on node integrity.

**Suppose in a computer network of multinational company, network administrator's system receives some ARP messages while communicating with other system. Considering this scenario you are required to tell how does system deal these incoming ARP messages? Briefly explain each step that is involved in this process.**

**Answer:-**

When an ARP message arrives, the protocol specifies that the receiver must perform two basic steps. First the receiver extracts the sender's addresses binding and checks to see if it is present in the cache. If not, it updates the cache.

The receiver examines the operation field of the message to determine whether the message is a request or a response. If the message is a request, the receiver compares the field TARGET PADDR with the local protocol address. If the two are identical, the computer is the target of the request and must send an ARP response.



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**Name the classes of network on the basis of mobility**

**Answer:-**

In this respect there are two types of networks.

- Fixed networks
- Mobile networks

In these days mobile networks are the hot case. Mobile networks have been emerged in the last decade. In this regard there are some issues which are attached with the mobility of networks which are as follows:

- Location and tracking
- Semi persistent connections
- Complex administration and billing as devices and users move around the network.

**In which ARP technique hardware address must be smaller than protocol address?**

**Answer:-**

Maximum Transmission Unit (MTU)

**Which protocol is capable of buffering the outgoing and incoming data in both directions?**

**Answer:-**

TCP can buffer outgoing and incoming data in both directions

**Do all LAN technologies include a type field in frame? Justify your answer with three reasons**

**Answer:-**

Some LAN technologies do not include a type field.

Sender and receiver can agree on interpretation, which is as follows:

They agree on single data format and use only that format this limits to one type of data.

In this way all computers on LAN must use one format. Also they agree to encode the data format into first few bytes of the data field.

**Suppose a host B sends some IP datagram' s to another host F. How host F machine will identify the lost fragment of IP datagram? Support your answer with solid reason.**



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**Answer:-**

IP may drop fragment because destination drops entire original datagram.

Destination sets timer with each fragment to identify lost fragment. If timer expires before all fragments arrive, fragment is assumed lost and datagram is dropped. Source (application layer protocol) is assumed to retransmit.

**If the reserved words of character stuffing are considered as a part of data in frames at the receiver side, which technique is required to overcome this situation and how it works? Briefly explain with the help of example.**

**Answer:-**

Sometimes the special character (i-e soh and eot) may appear in data and as a part of data they will be misinterpreted as framing data.

The solution to this problem is Byte stuffing.

In general to distinguish between data being sent and control information such as frame delimiters network systems arrange for the sending side to change the data slightly before it is sent because systems usually insert data or bytes to change data for transmission, the technique is known as Data Stuffing.

There are two types of data stuffing:

- **Byte Stuffing**
- **Bit Stuffing**

Byte stuffing refers stuffing with character oriented hardware and bit stuffing refers to bit oriented hardware.

Byte stuffing translates each reserved byte into two unreserved bytes. For example: it can use esc as prefix followed by x for soh, y for eot and z for eco.

The receiver then replaces each occurrence of esc x, esc y and esc z by the corresponding single character.

**Suppose an organization has a computer network where multicasting is required. There are different types of multicast routing protocols that can be used in this scenario. You are required to enlist five multicast routing protocols with complete names**

**Answer:-**

**MULTICAST PROTOCOLS:**

DISTANCE VECTOR MULTICAST ROUTING PROTOCOL (DVMRP):

CORE BASED TREES (CBT):

PROTOCOL INDEPENDENT MULTICAST\_ SPARSE MODE  
(PIM-SM):



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PROTOCOL INDEPENDENT MULTICAST \_ DENSE MODE  
(PIM-DM):

MULTICAST EXTENSIONS TO THE OPEN SHORTEST PATH  
FIRST PROTOCOL (MOSPF):

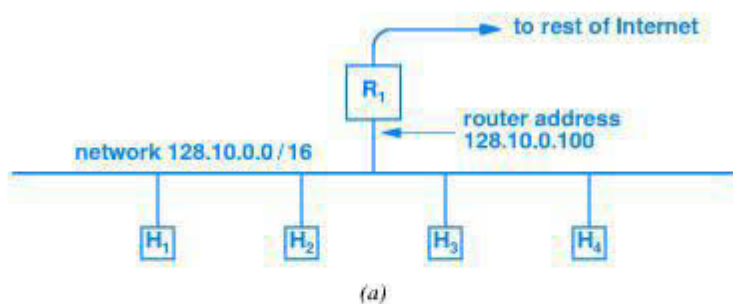
With multiple technologies in networking field where change in a routing table can happen frequently, does a router in the global Internet can still use static routing? In case of yes/no, how large is the routing table in a router? Support your answer with example.

**Answer:-**

STATIC ROUTING:

It is done at boot time. It is simple and has low network overhead. It is inflexible.

It is used by most Internet hosts. The typical routing table has two entries as shown in the figure. For the local network it has direct delivery and for the communication to some other network it follows the nearest default route. The example is shown in the figure below where four hosts are attached to an Ethernet which connects to the rest of the internet through router R1.



(a)

Net	Mask	Next hop
128.10.0.0	255.255.0.0	direct
default	0.0.0.0	128.10.0.100

(b)

As the route information protocol allows one router to exchange routing information with another, however this scheme cannot scale to the entire Internet because, if all routers attempted to exchange information, the resulting traffic would overwhelm the backbone networks. To solve the problem the



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routers and networks in the Internet are divided into groups. All routers within a group exchange routing information.

Then at least one router in the group summarizes information before sending it to other groups.

**Does TCP/IP protocol suite include an Address Resolution Protocol (ARP) and how many types of messages are used by ARP standard? Write their names**

**Answer:-**

Yes, TCP/IP protocol suite includes an Address Resolution Protocol (ARP).

The ARP standard defines two basic message types:

- Request
- Response

REQUEST:

This contains an IP address and requests the corresponding hardware address.

RESPONSE:

This contains both the IP address sent in the request and the hardware address.

**Suppose a medical company has computer network where TCP is used for flow control of transmission. Which mechanism is used by TCP for controlling the flow of data?**

**Answer:-**

TCP uses window mechanism to control the flow of data. The amount of buffer space available at any time is called the window and a notification that specifies the size is called the window advertisement.

**Which multicast protocol is designed to use within an organization? Give the complete name**

**Answer:-**

PROTOCOL INDEPENDENT MULTICAST \_ DENSE MODE

(PIM-DM):

A protocol designed for use within an organization. Routers that use PIM-DM broadcast (i.e. flood) multicast packets to all locations within the organization. Each router that has no member of a particular group sends back a message to prune the multicast routing tree ((i.e., a request to stop the flow of packets). The scheme works well for short-lived multicast sessions (e.g., a few minutes) because it does not require setup before transmission begins.



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**Which two identifiers in ATM are used to make virtual connection?**

**Answer:-**

ATM with 16-bit address, 24-bit connection identifier and connection identifier includes.

-8-bit Virtual Path Identifier (VPI)

-16-bit Virtual Circuit Identifier (VCI)

The connection identifier is local to each computer and it may be different at different parts of the ATM switch.

**Is it necessary to use terminator at both ends of thin Ethernet cable? Give your answer with at least two reasons.**

**Answer:-**

Yes, it is necessary to use terminator at both ends of thin Ethernet cable because If main cable is left un-terminated, any signal tx over the line echoes back and interferes with the original signal. A terminated absorbs the wave at the end and eliminates this echo

**In data transmission, the probability of packet loss always remains there. In TCP, explain with reason which procedure will be adopted to overcome such network traffic condition? Also write the consequence that can be faced if the traffic is not resumed carefully.**

**Answer:-**

Reliability is the responsibility of the Transport layer. In TCP/IP, TCP provides reliable transport service. Most Internet applications use TCP as no other protocol has proved to work better.

TCP achieves reliability by retransmission. An acknowledgement is used to verify that data has arrived successfully. If acknowledgement does not arrive, the previous data is retransmitted.

**HOW LONG SHOULD TCP WAIT BEFORE RETRANSMITTING:**

The time for acknowledgement to arrive depends on:

- Distance to destination
- Current traffic conditions

Multiple connections can be opened simultaneously. Traffic conditions change rapidly.

**It is very tedious work to manage a multicast type of transmission in an IP network but some characteristics are there which not only make IP multicast easy but also make it unique. You are required to describe these characteristics in detail.**





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### Answer:-

Internet Protocol (IP) multicasting is the sending of a single datagram to multiple hosts on a network or internetwork. Of the three delivery methods supported by IP, multicasting is the method that is most practical for one-to-many delivery.

It is the restricted form of broadcasting. It works like broadcasting however it does not forward frames automatically to the CPU.

The interface hardware is programmed in advance to accept certain frames that have multicast address as the destination address.

If an application program wishes to receive certain frames then it program the interface hardware to accept an additional set of addresses.

The interface hardware frame then begins accepting three types of frames:

- Multicast frames
- Broadcast frames
- The frames that are destined to the station itself.

**Maintaining the performance of a network is the key challenge for any network administrator. Network administrators usually use a specialized computer system in their network to keep themselves up-to-date with the performance of their network. You are required to write five main tasks performed by that computer in this regard**

### Answer:-

A network analyzer also called network monitor or a network sniffer is used to examine the performance of or debug a network.

It can report statistics such as capacity utilization, distribution of frame size, collision rate or token circulation time.

**Most of the networks in the world are using IPv4 at the time but there is a need of IPv6. Which circumstances enforce us to convert our networks to IPv6? Justify your answer with five proper reasons which depict that there is a need of IPv6.**

### Answer:-

One of the parameters, which motivated IP for change is address space. The 32-bit address space allows for over a million networks.

But most networks are class C and too small for many organizations. 214 class B network addresses already almost exhausted (and exhaustion was first predicted to occur, a couple of years ago).



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The second parameter is type of service, the IP provides. Different applications have different requirements for delivery reliability and speed. Current IP has type of service that is not often implemented. Another factor for the motivation for change is multicast.

**NEW FEATURES:**

The new features of IPV6 are as follows:

- IPV6 addresses are 128 bits.
- Header format is entirely different.
- Additional information is stored in optional extension headers, followed by data.
- Flow label and quality of service allows audio and video applications to establish appropriate connections.
- New features can be added more easily. So it is extensible.

Connectionless and connection oriented both protocols have different qualities in communication. UDP belongs to which category?

**Answer:-**

UDP provides connectionless service.

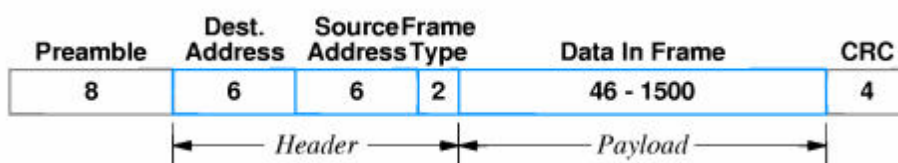
OSPF protocol is being used to replace the older RIP protocol in the Internet routing process. Discuss, does OSPF only share information within an area or among different areas?

**Answer:-**

OSPF Open Shortest Path First Protocol (OSPF) only share information within an area (IGP ).

As you know all current standards use the general frame format, write the names of five frame fields and mention how much space each field, contains?

**Answer:-**





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**Suppose a security agency wants to reduce the risk of data being compromised in its TCP based computer network. Which process is used by TCP to establish reliable connection and explain the process by giving all steps involved in this process?**

**Answer:-**

3-way handshake used to create a connection requires each end to generate a random 32-bit sequence number. If an application attempts to establish a new TCP connection after a computer reboots, TCP chooses a new random number.

When two processes wish to communicate, their TCP's must first establish a connection (initialize the status information on each side). When their communication is complete, the connection is terminated or closed to free the resources for other uses.

Since connections must be established between unreliable hosts and over the unreliable internet communication system, a handshake mechanism with clock-based sequence numbers is used to avoid erroneous initialization of connections.

**Precedence and Security:**

The users of TCP may indicate the security and precedence of their communication. Provision is made for default values to be used when these features are not needed.

**Write any four factors by which computer networks can be classified**

**Answer:-**

Computer networks are classified by four factors which are as follow:

- 1) BY SIZE:
- 2) BY CONNECTIVITY:
- 3) BY MEDIUM:
- 4) BY MOBILITY:

**Address Resolution Protocol is widely used in computer network for address mapping. Is ARP message format generally used for every frame format or has some restrictions for a specific frame format?**

**Answer:-**

It is shown in the figure below, in which T stands for Table lookup, C for Closedform Computation and D for Data Exchange.



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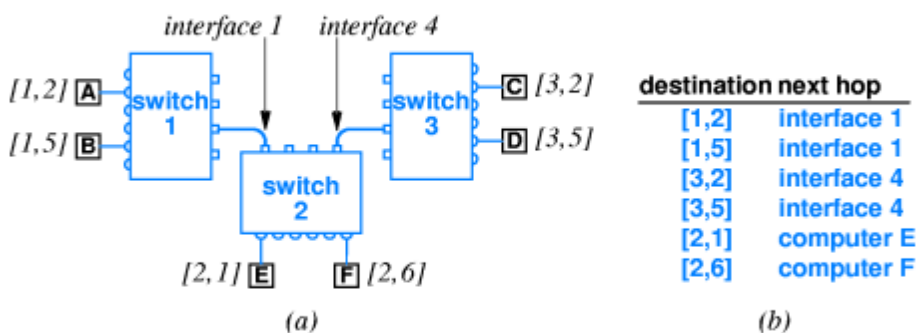
Feature	Type Of Resolution
Useful with any hardware	T
Address change affects all hosts	T
Protocol address independent of hardware address	T, D
Hardware address must be smaller than protocol address	C
Protocol address determined by hardware address	C
Requires hardware broadcast	D
Adds traffic to a network	D
Produces resolution with minimum delay	T, C
Implementation is more difficult	D

Describe the structure of physical addressing in WAN. If you have a physical address (1, 5) on a switch then how will you elaborate this address?

**Answer:-**

The physical addressing in a WAN is similar as in LAN in the following way:

- The data is transmitted in packets equivalent to frames.
- Each packet has a format with header.
- The packet header includes destination and source addresses.
- Many WANs use hierarchical addressing for efficiency. One part of address identifies destination switch. Other part of address identifies port on switch. This is shown in the figure below.



User datagram protocol provides fast communication as compare to TCP while communicating between devices in computer network. Best effort delivery is also one service of UDP. What is the main purpose of this service and also write the real time example of UDP.



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**Answer:-**

Best-effort delivery describes a network service in which the network does not provide any special features that recover lost or corrupted packets. These services are instead provided by end systems. By removing the need to provide these services, the network operates more efficiently. The postal service delivers letters using a best-effort delivery approach. You don't know for sure whether a letter has been delivered. However, you can pay extra for a delivery confirmation receipt, which requires that the carrier get a signature from the recipient and return it to you.

**Suppose being a network engineer you are given a task to design such type of network which would be able to overcome failure by itself. Which network technology will you propose and how it will work?**

**Answer:-**

Each topology has advantages and disadvantages, which are discussed below:

IN A RING:

It is easy to coordinate access to other computers however entire network is disabled if a cable cut occurs.

IN A STAR:

On the other hand only once computer is affected when a cable cut occurs.

IN A BUS:

The network needs fewer wires than a star, however entire network is disabled when a cable cut occurs.

**During transmission of data from source to destination in a network of 50 computers, some packets contain errors. In this situation, which field of IP datagram header will indicate about errors?**

**Answer:-**

HEADER CHECKSUM field of IP datagram header will indicate about errors.

**UDP and IP belong to different layers in OSI model and have different functionalities. What is the main difference of functionality between internet protocol and user datagram protocol?**

**Answer:-**

In general, differences in how UDP and TCP deliver data are similar to the differences between a telephone call and a postcard. TCP works like a telephone call by verifying that the destination is available and ready to communicate. UDP works like a postcard--messages are small and delivery is likely, but not always assured.

UDP is typically used by programs that transmit small amounts of data at one time or have real-time requirements. In these situations, the low overhead and multicasting capabilities of UDP (for example, one datagram, many recipients) are better suited than TCP.



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UDP contrasts directly with the services and features provided by TCP. The following table compares differences in how TCP/IP communication is handled depending on whether UDP or TCP is used for transporting data.

The screenshot shows a Google Books page with the title 'Table 3.1 Main differences between TCP and UDP protocols'. The table lists various communication aspects and compares how they are handled by TCP and UDP.

	TCP	UDP
Connection Establishment	3-ways handshake	Connectionless
Header size	20–60 bytes	8 bytes
Packet delivery	Ordered	Non guaranteed
Retransmissions	Cumulative and selective acknowledgments	None
Flow control	Sliding window	None
Congestion Control	Slow start, congestion avoidance, fast retransmit and fast recovery mechanisms	None

Suppose in a computer network of Leather Company, network engineer wants to examine whether an incoming Ethernet frame contains an ARP message or not. Which field of header will be used for this purpose and what specific value is used for it?

**Answer:-**

Let's find out how a computer knows whether an incoming frame contains an ARP message. The type field in the frame header specifies that the frame contain an ARP message. The Ethernet standard species that the type field in an Ethernet frame carrying an ARP message must contain the hexadecimal value 0 x 806, as shown in the figure below.

Dest. Address	Source Address	Frame Type	Data In Frame
		806	complete ARP message



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In an organization where a large network is deployed and some remote location are connected to it. Write the name of the protocol that can be used for network troubleshooting. Also explain the ways it can be used.

**Answer:-**

USING ICMP TO TRACE A ROUTE:

List of all routers on path from A to B is called the route from A to B. The intermediate routers send ICMP time exceeded message to the source and destination sends an ICMP destination unreachable message to the source.

Network operator needs a temporary virtual circuit for his network. Which type of ATM virtual circuit is most appropriate in this situation?

**Answer:-**

Connections in ATM are called virtual channels (VC) or virtual circuits (a term preferred by some). These are called virtual, since connections are formed in ATM by starting values in memory locations (tables) in ATM switches as opposed to making actual electrical connections.

Which types of Network Address Translation (NAT) devices are available?

**Answer:-**

Its implementations are available e.g.,

- Stand-alone hardware device
- IP router with NAT functionality embedded

If the application selects a datagram size greater than MTU along the path to the destination. How to handle MTU in this situation? Explain the process that may be used to handle the stated situation.

**Answer:-**

One technique is to limit datagram size to smallest MTU of any network. IP uses fragmentation i.e. datagrams can be split into pieces to fit in network with small MTU.

Router detects datagram larger than network MTU and then it splits into pieces and each piece is smaller than outbound network MTU.

Router has local MTU to computer size of each fragment. It puts part of data from original datagram in each fragment and puts other information into header.





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Consider an organization where a large scale network is deployed having both the static and dynamic environment for routing. How a network administrator can handle this static and dynamic routing when some update or change is required?

**Answer:-**

**STATIC ROUTING:**

It is used by most Internet hosts. The typical routing table has two entries as shown in the figure. For the local network it has direct delivery and for the communication to some other network it follows the nearest default route.

**DYNAMIC ROUTING:**

It is used by IP routers. It requires special software which continuously updates the routing information. Each router communicates with neighbors. It passes routing information and uses Route Propagation Protocol to exchange the information with other routers.

Reliability is the basic need of communication systems but some gateway protocols are considered unreliable. Discuss with reasons which gateway protocol is unreliable protocol for transportation of messages.

**Answer:-**

Border Gateway Protocol(BGP)

Suppose an organization wants voice communication in network by using ATM technology. Explain, how ATM eliminate the varying delays associated with variable size data packets?

**Answer:- (Page 66)**

ATM uses small, fixed sized packets called cells. Each cell has 53octets. VPI/VCI fields identify the cells destination.

Suppose a computer B on segment 1 of a LAN sends a frame to a computer F on segment 2 of the same LAN. If the bridge receives the frame from B, just after restarted then in this case will the bridge broadcast the frame or just sent it to a particular computer. Justify your answer with reason.(3 Marks)

**Answer:- (Page 50)**

Yes after restarted the bridge, the bridge can send this frame to the particular computer F





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on segment 2 because A frame is forwarded to the other segment, if it is destined to that segment.

**Suppose as a network Administrator of XYZ organization, you are given a task to develop a network in a limited area with low cost, then which wiring scheme will you use? Justify your answer with four solid reasons. (5 Marks)**

**Answer:-**

10Base-T is used for wiring scheme. Because it is best for LAN (limited area network)  
Twisted pair Ethernet is the cheapest wiring that makes it so popular.  
To allow changing the wiring without changing the interface hardware, NICs support  
Multiple wiring schemes are not limited to Ethernet technology.  
Hubs (physically a star topology) but logically a Bus topology.  
Hub used for extension of connection with multiplexing concept  
Hub detect error quickly when 1 computer is down  
If one computer fails it doesn't affect whole network.

**A) An internet of four networks and three routers (R1, R2 and R3) with an IP address assigned to each router interface as shown in figure (a), write the routing table as shown in figure (b) found in R2, where each entry in the table lists a destination, mask, and the next hop used to reach the destination.**

**B) What will be the Hop count for a packet to reach from 192.4.10.0 to 30.0.0.0?**

Note a figure (a) and this blank table was given and we to fill it.

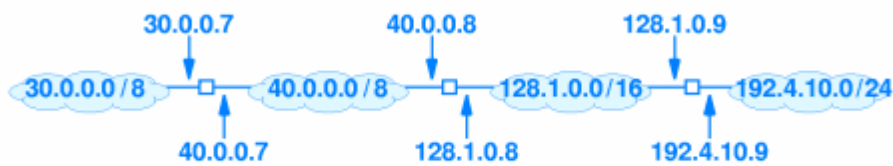
Destination	Mask	Next Hop
30.0.0.0		
40.0.0.0		
128.1.0.0		
192.4.10.0		

**Answer:-**



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(a)

Destination	Mask	Next Hop
30.0.0.0	255.0.0.0	40.0.0.7
40.0.0.0	255.0.0.0	deliver direct
128.1.0.0	255.255.0.0	deliver direct
192.4.10.0	255.255.255.0	128.1.0.9

(b)

**Question:** Tell the first assignable IP address from a 128.140.80.24/20.

**Answer:-** [according to book](#)

The host address range for this subnet is 128.140.80.1 - 128.140.95.254, so the first assignable IP address is 128.140.80.1.

**Question:** What is the main difference between TCP and UDP? (2)

**Answer:-** [\(Page 120,123\)](#)

**TCP (Transmission Control Protocol)**

- TCP is a connection-oriented protocol.
- A connection can be made from client to server, and from then on any data can be sent along that connection.
- TCP Provide a Reliability due to connection oriented features.

**UDP (User Datagram Protocol)**

- A simpler message-based connectionless protocol.
- Messages (packets) can be sent across the network in chunks.
- UDP is Unreliable - as it could get lost on the way.



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**Question: Why more preference given to TCP as comparative to UDP**

**Answer:-** [click here for details](#)

TCP provide reliability as it follows connection oriented protocol paradigm that is why TCP is given preference over UDP.

**Question: How is TCP a reliable protocol? (Marks=2)**

**Answer:-** (Page123 )

- TCP is a connection-oriented protocol.
- A connection can be made from client to server, and from then on any data can be sent along that connection.
- TCP Provide a Reliability due to connection oriented features.

**The maximum payload of a TCP segment is 65,495 bytes. Why was such a strange number chosen?(3)**

**Answer:-** [click here for details](#)

A TCP segment must fit inside an IP packet. The TCP header is a fixed-format of 20- bytes, and the IP header is also 20 bytes long. Since the maximum length of an IPv4 packet is 65,535 bytes, this leaves only  $65,535 - 20 - 20 = 65,495$  bytes left for TCP payload.

**Question: Why does UDP exist? Would it not have been enough to just let user processes send raw IP packets?(3)**

**Answer:-** [click here for details](#)

UDP instead of raw IP is used because the UDP header contains the port information for the source and destination machines. This allows the machines to know which processes the packet came from and should be sent to. This information is not available anywhere in the header for the raw IP packet. It would not have been enough to just let user processes send raw IP packets.

**Question: Differentiate between UNICAST, MULTICAST AND BROADCAST (6)**

[click here for details](#)

Three methods can be used to transmit packets over a network: unicast, multicast, and broadcast. Unicast involves communication between a single sender and a single receiver. This is a type of point-to-point transmission; since the packet is transmitted to one destination at a time.

Multicast is used to send packets to a group of addresses, represented by a "group address." In this case, packets are transmitted from a single sender to multiple receivers. Since the same data packet can be sent to multiple nodes by sending just one copy of the data, the load of the sender and the overall load of the network are both reduced.

Broadcast involves sending packets to all nodes on a network simultaneously. This type of transmission is used to establish communication with another host, and for DHCP type methods of



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assigning IP addresses. In the first case, it's needed because your packets must know the proper MAC address to send packets to a machine on your local network.

Suppose you know the IP address (obtained, for example, by querying a DNS server), but have not yet determined the MAC address that belongs to the node. If you broadcast a packet that asks requests the identity of the node with that particular IP address, every machine on the network will receive the message, but only the one with that IP address will respond.

**Question: Differentiate between connectionless and connection-oriented protocol? (6)**

**Answer:-** [click here for details](#)

**Connection-oriented**

- Requires a session connection (analogous to a phone call) be established before any data can be sent.
- This method is often called a "reliable" network service.
- It can guarantee that data will arrive in the same order.
- Connection-oriented services set up virtual links between end systems through a network.

**Connectionless**

- Does not require a session connection between sender and receiver.
- The sender simply starts sending packets (called data-grams) to the destination.
- This service does not have the reliability of the connection-oriented method, but it is useful for periodic burst transfers.
- Neither system must maintain state information for the systems that they send transmission to or receive transmission from.
- A connectionless network provides minimal services.

**Question: Define special IP..(5)**

**Answer:-** [click here for details](#)

Special IP's are those IP's which are not assigned to any machine; these are reserve IP's, used for special purpose, for example.

**Question: Routing information Protocol define briefly (10)**

**Answer:-** [click here for details](#)

The Routing Information Protocol (RIP) is a dynamic routing protocol used in local and wide area networks. As such it is classified as an interior gateway protocol (IGP). It uses the distance-vector routing algorithm. It was first defined in RFC 1058 (1988). The protocol has since been extended several times, resulting in RIP Version 2 (RFC 2453). Both versions are still in use today, however, they are considered to have been made technically obsolete by more advanced techniques such as



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Open Shortest Path First (OSPF) and the OSI protocol IS-IS. RIP has also been adapted for use in IPv6 networks, a standard known as RIPng (RIP next generation), published in RFC 2080 (1997).

Features of RIP

- ☐ Routing within an autonomous system (IGP) ☐ Hop count metric
- ☐ Unreliable transport (uses UDP)
- ☐ Broadcast or multicast delivery
- ☐ Default Route Propagation
- ☐ Distance vector algorithm
- ☐ Passive version for host

**Question: What is OSPF (2)**

**Answer:-** [click here for details](#)

Open Shortest Path First (OSPF) is a dynamic routing protocol for use in Internet Protocol (IP) networks. Specifically, it is a link-state routing protocol and falls into the group of interior gateway protocols, operating within a single autonomous system (AS).

**Question: What is mean by address resolution with centralization message exchange?**

**Answer:-** [click here for details](#)

A network includes one or more servers that are assigned the task of answering address resolution requests. It has an advantage that resolution is easier to configure, manage and control.

**Question: To solve the problem the routers and networks in the internet are divided into groups, how large do you think are these groups? (Marks=2)**

**Answer:-** [click here for details](#)

There is no limit to determine the size of group, it can be large or small depends upon net work administrator.

**Question: How does a packet pass across an internet? (Marks=3)**

**Answer:-** [click here for details](#)

- A source creates the packet and places the destination address in a packet header • The packet is sent to the nearest router
- The router uses the destination address to select the next router on the path to the destination, and then transmits the packet.
- The packet reaches the router that can deliver the packet to its final destination.



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**Question: What are the problem that IP does not guarantee and how to handle these problems? (Marks=3)**

**Answer:-** [click here for details](#)

IP does not guarantee the following problems:

- Delivery of packets
- Delivery of packets in sequence.

**Question: How can Universal Services be achieved? (Marks=5)**

**Answer:-** [click here for details](#)

The goal of internetworking is universal service across heterogeneous networks. To provide this service all computers and routers must agree to forward information from a source on one network to a specified destination. The task is complicated as frame formats and addressing schemes may differ. The key of achieving universal service is universal protocol software (TCP/IP).

What are the main advantages and disadvantages of Routing Information Protocol (RIP)? (Marks=5)

Advantages:

- \* Simple to implement
- \* Low requirement in processing and memory at the nodes
- \* Suitable for small networks

Disadvantages:

- \* Slow convergence
- \* Bouncing effect
- \* Counting to infinity problem from Routing Basics, RIP
- \* Poor metrics. RIP only supports a hop count metric, with a maximum value of 15 hops.

**Question: Can a router in the global internet use static routing the same way a host does? If so, how large is the routing table in a router? (Marks=10)**

**Answer:-** [click here for details](#)

The answers of these questions are complex. Although cases exist where a router uses static routing, most routers are using dynamic routing.

**Question: Define what is the Extension Headers in IPv6. (2)**

**Answer:-** [click here for details](#)

In IPv6, optional internet-layer information is encoded in separate headers that may be placed between the IPv6 header and the upper-layer header in a packet. There are a small number of such extension headers, each identified by a distinct Next Header value. As illustrated in these examples, an IPv6 packet may carry zero, one, or more extension headers, each identified by the Next Header field of the preceding header.



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**Question: If IPv4 is so successful, then why change IPv6? (5 marks)**

**Answer:-** [click here for details](#)

Internet Protocol Version 6 (IPv6) is designed to increase Internet global address space to accommodate the rapidly increasing numbers of users and applications that require unique global IP addresses and help enable a global environment where the addressing rules of the network are again transparent to applications.

**Question: What are IPv6 ADDRESS NOTATION? (5)**

**Answer:** [click here for details](#)

The standard notation for IPv6 addresses is to represent the address as eight 16-bit hexadecimal words separated by ``:" (colons). For example:

FEDC:BA98:0332:0000:CF8A:000C:2154:7313

**Question: In internet routing how does a host join or leave a group? (3)**

**Answer:-** [click here for details](#)

A standard protocol exists that allows a host to inform a nearby router whenever the host needs to join or leave a particular multicast group known as Internet Group Multicast Protocol (IGMP). The computer uses IGMP to inform the local router about the last application when it leaves.

**Question: In IP datagram format, what does the field SERVICE TYPE do? (2 marks)**

**Answer:-** [click here for details](#)

SERVICE TYPE shows sender's preference for low latency, high reliability that is rarely used.

**Question: What is the concept of classes for IP Addresses? Briefly describe each class (10)**

**Answer:-** [click here for details](#)

The original IP address scheme divides host addresses into three primary classes. The class of an address determines the boundary between the network prefix and suffix.

The original classes of IP addresses are shown in the figure below.

**Question: What is stored in routing table? (3 marks)**

**Answer:-** [click here for details](#)



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A routing table is used by TCP/IP network routers to calculate the destinations of messages it is responsible for forwarding. The table is a small in-memory database managed by the router's built-in hardware and software.

#### Routing Table Entries and Sizes

Routing tables contain a list of IP addresses. Each IP address identifies a remote router (or other network gateway) that the local router is configured to recognize. For each IP address, the routing table additionally stores a network mask and other data that specifies the destination IP address ranges that remote device will accept.

**Question: What are implementations of NAT? (3 marks)**

**Answer:-** [click here for details](#)

The figure below shows the implementation of NAT. We can see that the old and new values of IP source field and destination field are shown with their directions. NAT device stores state information in table. The value is entered in the table when NAT box receives outgoing datagram from new.

**Question: Why organizations don't use a single router to connect its entire network? (3)**

**Answer:-** [click here for details](#)

Organization seldom uses a single router to connect its entire network for two reasons.

- Because the router must forward each packet, the processor in a given router is insufficient to handle the traffic
- Redundancy improved Internet reliability.

**Question: What are the characteristic of border gateway protocol? (5 marks)**

**Answer:-** [click here for details](#)

The characteristics of BGP follow:

- BGP is an exterior gateway protocol (EGP) used in routing in the Internet. It is an inter-domain routing protocol.
- BGP is a path vector routing protocol suited for strategic routing policies.
- BGP uses TCP Port 179 to establish connections with neighbors.
- BGPv4 implements CIDR.
- eBGP is for external neighbors. It's used between separate autonomous systems.
- iBGP is for internal neighbors. It's used within an AS.
- BGP uses several attributes in the routing-decision algorithm.
- BGP uses confederations and route reflectors to reduce BGP peering overhead.
- The MED (metric) attribute is used between autonomous systems to influence inbound traffic.
- Weight is used to influence the path of outbound traffic from a single router, configured locally.





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**Question: Does OSPF only share information within an area or does it allow communication between areas? (2)**

**Answer:-** [click here for details](#)

OSPF allows subdivision of Autonomous System into areas. The link-status information is propagated within an area. The routes are summarized before being propagated to another area. It reduces overhead (less broadcast traffic). Because it allows a manager to partition the routers and networks in an autonomous system into multiple areas, OSPF can scale to handle a larger number of routers than other IGPs.

**CHARACTERISTICS OF A SERVER:**

The characteristics of a server are explained below:

- "It is a special-purpose, privileged program.
- "It is dedicated to provide one service.
- "It can handle multiple remote clients simultaneously.
- "It invoked automatically when system boots.
- "It executes forever.
- "It needs powerful computer and operating system.
- "It waits for client contact.
- "It accepts requests from arbitrary clients.

**Question: With help of the diagram below, explain TCP Segment Format.**

**Answer** [click here for details](#)

- **Source Port:** The 16-bit port number of the process that originated the TCP segment on the source device.
- **Destination Port:** The 16-bit port number of the process that is the ultimate intended recipient of the message on the destination device.
- **Sequence Number:** For normal transmissions, the sequence number of the first byte of data in this segment. In a connection request (SYN) message, this carries the initial sequence number (ISN) of the source TCP.
- **Acknowledgment Number:** When the ACK bit is set, this segment is serving as an acknowledgment (in addition to other possible duties) and this field contains the sequence number the source is next expecting the destination to send
- **Data Offset:** Specifies the number of 32-bit words of data in the TCP header. In other words, this value times four equals the number of bytes in the header, which must always be a multiple of four. It is called a “data offset” since it indicates by how many 32-bit words the start of the data is offset from the beginning of the TCP segment.
- **Reserved:** 6 bits reserved for future use; sent as zero.
- **Control Bits:** TCP does not use a separate format for control messages instead certain bits are set for controlling communication.



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- Window: Indicates the number of octets of data the sender of this segment is willing to accept from the receiver at one time.
- Checksum: A 16-bit checksum for data integrity protection, computed over the entire TCP datagram plus a special “pseudo header” of fields. It is used to protect the entire TCP segment against not just errors in transmission, but also errors in delivery. Optional alternate checksum methods are also supported.
- Urgent Pointer: Used in conjunction with the URG control bit for priority data transfer. This field contains the sequence number of the last byte of urgent data.
- Options: Set for other options
- Padding: If the Options field is not a multiple of 32 bits in length, enough zeroes are added to pad the header so it is a multiple of 32 bits.
- Data: The bytes of data being sent in the segment.

**Question: What is ATM?**

**Answer:-** [click here for details](#)

Asynchronous Transfer Mode (ATM) is a technology that has the potential of revolutionizing data communications and telecommunications. Based on the emerging standards for Broadband Integrated Services Digital Networks (B-ISDN), ATM offers the economically sound "bandwidth on demand" features of packet-switching technology at the high speeds required for today's LAN and WAN networks and tomorrow's.

**Question: WHAT IS THE FUNCTION OF IANA?**

**Answer:-** [click here for details](#)

IANA (Internet Assigned Numbers Authority) is an operating unit of the Internet Corporation for Assigned Names and Numbers (ICANN) that maintains the top-level domain, IP address and protocol number databases.

**Question: What is the facility of IP multicast?**

**Answer:-** [click here for details](#)

IP Multicast is a protocol for transmitting IP datagrams from one source to many destinations in a local or wide-area network of hosts which run the TCP/IP suite of protocols. The basic facility provided by the IP protocol is a unicast transmission service: That is, the current standard for IP provides only unreliable transmission of datagrams from a single source host to a single destination host. . A packet which is destined for N recipients can be sent as just a single packet!

**Question: How many large groups of routers do you think?**

**Answer:-** [click here for details](#)



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We will draw any routers we may be using to separate major portions of our network first. Smaller private networks do not require routers, but may still use them for administrative reasons. Routers are only required if

- a.) Dividing our network into multiple smaller networks,
- b.) Allowing indirect internet access using NAT. Next, add any switches and hubs. For small networks, only one switch or hub may be necessary.

**Question: What is colon hexadecimal notation?**

**Answer:-** [click here for details](#)

Colon Hexadecimal Notation is the notation used to represent IPv6 addresses. The 128 bits address is divided in 8 blocks of 16 bits separated by colons. One example is  
805B:2D9D:DC28:0000:0000:FC57:D4C8:1FFF

**Question: How ICMP trace a route?**

**Answer:-** [click here for details](#)

ICMP messages can be used to check whether hosts are reachable. The ICMP command can also be used to trace routes to Internet hosts by sending UDP datagrams to unused UDP ports and interpreting the ICMP responses (Van Jacobsen and Steve Deering algorithm).

The ICMP trace command works similar to the ICMP TTL command but it always returns the destination address even when the responding host chooses another interface with a different IP address to send the reply. This can be used to trace a route to a host since the command returns the host that discards the packet if it does not reach the destination.

**Question: What is meant by bridging of two buildings?**

**Answer:-** [click here for details](#)

Bridge mode uses WDS (Wireless Distribution System) which is generally used for extending wireless range or bridging between two network segments wirelessly, for example, connecting two office buildings. In technical terms we say a bridge type connects a wireless network to a wired network transparently.

- Device will act as a transparent bridge and will operate in Layer 2 - Mac layer
- Bridge mode association is based on channel and MAC authorization only. SSID will not be used for the setting up a link.
- If the remote is configured in a bridge mode and channel needs to be changed then channel needs to be changed at both the radios.

**Question: How does a computer differentiate IP datagram and ARP?**

**Answer:-** [click here for details](#)



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IP datagram receives a datagram, has exact destination address, and find next hop address and it uses IP address across physical network to send, forward or deliver. [www.vustudents.net](http://www.vustudents.net)  
Where as in ARP Computer caches ARP responses in local ARP cache/table. Using ARP for each IP packet adds two packets of overhead for each IP packet.  
The old and new values of IP source field and destination field are shown with their directions. NAT device stores state information in table. The value is entered in the table when NAT box receives outgoing datagram from new.

**Question: As OSPF allow an autonomous system into multiple AREAS OSPF produced complex or powerful networks?**

**Answer:-** [click here for details](#)

I think it reduces overhead (less broadcast traffic). Because it allows a manager to partition the routers and networks in an autonomous system into multiple areas, OSPF can scale to handle a larger number of routers than other IGPs.

Transmission Control Protocol is a transmission protocol which ensures reliable and sequential data delivery. It establishes so called virtual connections and provides tools for error correction and data stream control. It is used by most of applications protocols which require reliable transmission of all data, such as HTTP, FTP, SMTP, IMAP, etc.

**Question: Differentiate distance vector and link state?**

**Answer:-** [click here for details](#)

"Distance Vector" and "Link State" are terms used to describe routing protocols which are used by routers to forward packets between networks. The purpose of any routing protocol is to dynamically communicate information about all network paths used to reach a destination and to select t from those paths, the best path to reach a destination network. Distance vector protocols use a distance calculation plus an outgoing network interface (a vector) to choose the best path to a destination network. The network protocol (IPX, SPX, IP, AppleTalk, DECnet etc.) will forward data using the best paths selected. Common distance vector routing protocols include AppleTalk RTMP, IPX RIP, RIP and IGRP . It's well supported. Protocols such as RIP have been around a long time and most, if not all devices that perform routing will understand RIP

Link State protocols track the status and connection type of each link and produce a calculated metric based on these and other factors, including some set by the network administrator. Link state protocols know whether a link is up or down and how fast it is and calculates a cost to 'get there' Link State protocols will take a path which has more hops, but that uses a faster medium over a path using a slower medium with fewer hops.



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**Question: What are the disadvantages of rip?**

**Answer:-** [click here for details](#)

The disadvantages of the Routing Information Protocol (RIP) are as follows:

- RIP generates additional protocol traffic, as it propagates routing information by periodically transmitting the entire routing table to neighbor routers.
- It is not suitable for large networks, because RIP packet size increases as the number of networks increases.
- It requires a lengthy convergence time.
- In RIP, the count-to-infinity problem persists when a link between two routers is broken down and the remaining routers recalculate the hop count to infinity.

**Question: Write a note on ipv6 base header format?**

**Answer:-** [click here for details](#)

The network header of the currently deployed IPv4 protocol is 20 bytes (plus options).

IPv6 omits the group of fields in the second 32-byte word of the IPv4 header. A decision was made that IPv6 routers would not support fragmentation within the network, following poor performance for router-based IPv4 fragmentation. IPv6 still supports host-fragmentation and transparent link/tunnel fragmentation (where the packet is reassembled at the next-hop).

The IPv6 header also omits the network checksum. This was removed on the basis that routers were reliable, and that checksum processing incurred an unnecessary overhead in high-speed routers.

Instead, IPv6 relies upon the presence of the pseudo-header in the transport checksum to validate that a packet has been delivered to the intended recipient.

The resulting IPv6 base header is 40 bytes. This increase in header size was not accompanied by an increase in complexity; the IPv6 base header is much simpler, comprising just 8 fields. The main reason for the larger size is to accommodate a pair of larger network addresses, increasing the size from 32 to 128 bits.

**Question: What are the advantages of a multipoint connection over a point-to-point connection?**

**Answer:-** [click here for details](#)

Point-to-point connection is limited to two devices, where else more than two devices share a single link in multipoint connection. Multipoint connection can be used for fail-over and reliability.

**Question: What's the name of the telephone service in which there is no need of dialing?**

**Answer:-** [click here for details](#)

DSS (digital data service) is the telephone service in which there is no need of dialing.



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**Question: Which types of frames are present in BSC frames?**

**Answer:-** [click here for details](#)

There are two types of frames that are present in BSC.

1. Control Frames and
2. Data Frames

**Question: What methods of line discipline are used for peer to peer and primary secondary communication?**

**Answer:-** [click here for details](#)

Line discipline is done in two ways:

1. ENQ/ACK (Enquiry Acknowledgement)  
This is used for peer to peer communication.
2. Poll/ Select

This method is used for primary secondary communication.

**Question: How does the checksum checker know that the received data unit is undamaged? [3]**

**Answer:-** [click here for details](#)

Checksum Checker or generator:

The sender subdivides data units into equal segments of „n“ bits(16 bits)

1. These segments are added together using one's complement.
2. The total (sum) is then complemented and appended to the end of the original data unit as redundancy bits called CHECKSUM.
3. The extended data unit is transmitted across the network.
4. The receiver subdivides data unit and adds all segments together and complement the result.
5. If the intended data unit is intact, total value found by adding the data segments and the checksum field should be zero.
6. If the result is not zero, the packet contains an error & the receiver rejects it.

**Question: Which one has more overhead, a repeater or a bridge? Explain your answer. [3]**

**Answer:-** [click here for details](#)

A bridge has more overhead than a repeater. A bridge processes the packet at two layers ; a repeater processes a frame at only one layer. A bridge needs to search a table and find the forwarding port as well as to regenerate the signal; a repeater only regenerates the signal. In other words, a bridge is also a repeater (and more); a repeater is not a bridge.



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**Question: Write down disadvantages of Ring Topology.**

**Answer:-** [click here for details](#)

Disadvantages of Ring Topology Unidirectional Traffic A break in a ring that is a disabled station can disable the entire network can be solved by using: Dual Ring or A switch capable of closing off the Break.

**Question: How parity bits are counted in VRC error detection method technique in case of odd parity generator?**

**Answer:-** [click here for details](#)

For example:

We want to TX the binary data unit 1100001

Adding together the number of 1's gives us 3, an odd number Before TX, we pass the data unit through a parity generator, which counts the 1's and appends the parity bit (1) to the end The total number of 1's is now 4, an even number The system now transfers the entire expanded across the network link When it reaches its destination, the RX puts all 8 bits through an even parity checking function If the RX sees 11100001, it counts four ones, an even number and the data unit passes When the parity checker counts the 1's, it gets 5 an odd number The receiver knows that an error has occurred somewhere and therefore rejects the whole unit Some systems may also use ODD parity checking The principal is the same as even parity.

**Question: Explain Protocol Data Unit (PDU)?**

**Answer:-** [click here for details](#)

Answer: Protocol data unit (PDU) is an OSI term that refers generically to a group of information added or removed by a particular layer of the OSI model. In specific terms, an LxPDU implies the data and headers defined by layer x. Each layer uses the PDU to communicate and exchange information. The PDU information is only read by the peer layer on the receiving device and then stripped off, and data is handed over to the next upper layer.

**Question: What is the basic concept of Twice NAT (Network Address Translation)?**

**Answer:-** (Page )

Twice NAT is another variant of NAT. it is used with site that runs server. In this process NAT box is connected to Domain Name.

Basic NAT does not work well for communication initiated from the Internet. Twice NAT allows a site to run servers. It requires the DNS to interact with the NAT device. Twice NAT fails if an application uses the IP addresses instead of Domain Name.





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**Question: Message oriented Interface, advantages and disadvantages (5)**

**Answer:- (Page120 )**

**MESSAGE-ORIENTED INTERFACE:**

UDP offers application programs a Message-Oriented Interface. It does not divide messages into packets for transmission and does not combine messages for delivery. Let's discuss its advantages and disadvantages.

**ADVANTAGES:**

- Applications can depend on protocol to preserve data boundaries.

**DISADVANTAGES:**

- Each UDP message must fit into a single IP datagram.
- It can result to an inefficient use of the underlying network.

**Question: Concept of area in OSPF (Open Shortest Path First Protocol)**

**OR**

**Does OSPF share information within an area or it allow communication b/w area? 2 marks**

**Answer:- (Page 120)**

**OSPF AREAS:**

OSPF allows subdivision of Autonomous System into areas. The link-status information is propagated within an area. The routes are summarized before being propagated to another area. It reduces overhead (less broadcast traffic). Because it allows a manager to partition the routers and networks in an autonomous system into multiple areas, OSPF can scale to handle a larger number of routers than other IGPs.

**Question: Benefits of data stuffing .**

**Answer:- (Page120 )**

In general to distinguish between data being sent and control information such as frame delimiters network systems arrange for the sending side to change the data slightly before it is sent because systems usually insert data or bytes to change data for transmission, the technique is known as Data Stuffing.

**Question: Write some merits used by routing protocols.**

**Answer:- (Page135 )**

A routing protocol is a protocol that specifies how routers communicate with each other, disseminating information that enables them to select routes between any two nodes on a computer network, the choice of the route being done by routing algorithms.





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There are two broad classes of Internet Routing Protocol:

**INTERIOR GATEWAY PROTOCOLS (IGPs):**

It is used among routers within autonomous system. The destinations lie within IGP.

**EXTERIOR GATEWAY PROTOCOLS (EGPs):**

It is used among autonomous systems. The destinations lie throughout Internet.

**Question: What are two important principal that IP address hierarchy grantee? 2 marks**

**Answer:-** (Page85 )

THE IP ADDRESS HIERARCHY:

Each 32-bit IP address is divided into two parts:

**PREFIX:**

It identifies the physical network to which the computers are attached.

**SUFFIX:**

It identifies an individual computer on the network.

**Question: Where should ICMP message be sent? 2 marks**

**Answer:-** (Page117 )

ICMP message is sent in response to incoming datagrams with problems. ICMP message is not sent for ICMP message.

**Question: How the TCP is reliable protocol? 2 marks**

**Answer:-** (Page 123)

Reliability is fundamental in a computer system. Software in the Internet must provide the same level of reliability as a computer system. Software must guarantee prompt and reliable communication without any loss, duplication, and change in the order.

**Question: Where the connection is orients service use connection identifier instead of full address? 2**

**Answer:-** (Page 67)

The connection-oriented service paradigm for networking is similar to the manner in which telephones are used. This is given as follows: A caller dials a number of the destination. The telephone at the destination signals the arrival of a connection request. If the called person does not answer; the caller gives up after waiting for a timeout. If the called person does answer, then the connection is established.

In data communication, as binary connection identifier is given to each of the two Parties to enable identification of the connection.



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**Question: Summarize IP multicast semantics? 2 marks**

**Answer:-** [\(Page 142\)](#)

**IP MULTICAST SEMANTICS:**

IP multicast group is anonymous in two ways:

1. Neither a sender nor a receiver knows the identity or the number of group members.
2. Routers and hosts do not know which applications will send a datagram to a group.

**Question: Internet routing how does a host join and leave the group? 3 marks**

**Answer:-** [click here for details](#)

A host sends a request to create, join, or leave a group to an immediate neighbor gateway. If the host requests creation of a group, a new network membership record is created by the serving gateway and distributed to all other gateways. If the host is the first on its network to join a group, or if the host is the last on its network to leave a group, the group's network membership record is updated in all gateways.

**Question: Write the new features of IPv6? 3 marks**

**Answer:-** [\(Page 111\)](#)

The new features of IPv6 are as follows:

- IPv6 addresses are 128 bits.
- Header format is entirely different.
- Additional information is stored in optional extension headers, followed by data.
- Flow label and quality of service allows audio and video applications to establish appropriate connections.
- New features can be added more easily. So it is extensible.

**Question: Difference between explicit and implicit frame type? 3 marks**

**Answer:-** [\(Page 36\)](#)

**EXPLICIT FRAME TYPE:**

In this type the identifying value is included with frame describes types of included data. **IMPLICIT FRAME TYPE:**

In implicit frame the receiver must infer from frame data.

**Question: What is the difference between the physical and logical topologies?**

**Answer:-** [click here for details](#)

Every LAN has a topology, or the way that the devices on a network are arranged and how they communicate with each other.



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**PHYSICAL TOPOLOGY:**

The way that the workstations are connected to the network through the actual cables that transmit data -- the physical structure of the network -- is called the physical topology. It depends on the wiring scheme.

**LOGICAL TOPOLOGY:**

The logical topology, in contrast, is the way that the signals act on the network media, or the way that the data passes through the network from one device to the next without regard to the physical interconnection of the devices. We can say that it is defined by the specific network technology.

**STORE AND FORWARD:**

Data delivery from one computer to another is accomplished through store and forward technology. In this technology packet switch stores incoming packet and also forwards that packet to another switch or computer. For this purpose packet switch has internal memory into which it can hold packet if outgoing connection is busy. Packets for each connection held on queue.

**Question: How can Switched Virtual Network be established?**

[Answer:- \(Page 70\)](#)

**SWITCHED VIRTUAL CIRCUITS:**

Most networks offer dynamic connections, which last for a relatively short time.

To handle this, ATM can dynamically establish a switched virtual circuit (SVC), allow it last as long as necessary and then terminate it.

The terminology comes from the Telco's where switching system normally refers to all switching.

**ESTABLISHING AN SVC:**

The computer sends a connection request to the switch to which it is attached.

Software in the switch finds a network path to the destination and sends along the connection request.

Each pair of switches in the path communicates to choose a VPI/VCI for their tables. Once the connection is established by the destination, a message is sent back to the originating computer to indicate the SVC is ready.

If any switch or the destination computer does not agree to setting up the VC, an error message is sent back and the SVC is not established.

**Question: Define Vector-Distance Algorithm.**

[Answer:- \(Page 63\)](#)

Packet switches wait for next update message and they iterate through entries in message.

If entry has shortest path to destination, insert source as next hop to destination and record distance as distance from next hop to destination plus distance from this switch to next hop.



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**Question: How can a bridge know whether to forward frames?**

**Answer:-** [click here for details](#)

The bridge builds a list of MAC addresses on either side of the bridge. Therefore, it knows which packets should be forwarded to the other side and which should not. Most bridges are self-learning bridges. As soon as a frame arrives to a bridge, it extracts a source address from its header and automatically adds it in the list for that segment. In this way a bridge builds up address lists. In the example of a packet that uses a MAC address not in its table it can err on the side of caution by forwarding the packet.

**Question: Describe the process of routing packets.**

**Answer:-** [click here for details](#)

Routing is the act of moving information across an internet work from a source to a destination.

**Question: What are some routing algorithm types?**

**Answer:-** [click here for details](#)

Static, dynamic, flat, hierarchical, host-intelligent, router-intelligent, intra-domain, inter-domain, link-state, and distance vector. Compare connection oriented and connectionless Service.

Connection-Oriented vs. Connectionless Service This characteristic specifies whether conversations take place in a more or less structured manner. When using a connection-oriented protocol, you incur the overhead of setting up a virtual circuit (a defined communications path) between the sender and receiver, which is maintained until the sender and receiver have completed their entire conversation. When the conversation is completed, you incur the overhead of tearing down the virtual circuit.

Connection-oriented protocols provide guaranteed delivery of messages in the order in which they were sent.

Contrast this with Connectionless service, which does not require establishing a session and a virtual circuit. This can be found in the network layer or transport layer, depending on the protocol. You can think of a connectionless protocol as being akin to mailing a post card. You send it and hope that the receiver gets it. Common features of a connectionless service are:

- Packets do not need to arrive in a specific order
- Reassembly of any packet broken into fragments during transmission must be in proper order
- No time is used in creating a session
- No Acknowledgement is required.
- The largest connectionless

**Question: What is meant by the Client-Server Paradigm? (2)**

**Answer:-** (Page 145)

It is used by all network applications. The passive program is called a server and the active program is called a client.



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**Question: Find the class of each address**

- a. 00000001 00001011 00001011 11101111
- b. 11000001 10000011 00011011 11111111
- c. 10100111 11011011 10001011 01101111
- d. 11110011 10011011 11111011 00001111

**Answer:-** [click here for details](#)

- a. The first bit is 0. This is a class A address.
- b. The first 2 bits are 1; the third bit is 0. This is a class C address.
- c. The first bit is 0; the second bit is 1. This is a class B address.
- d. The first 4 bits are 1s. This is a class E address.

- 0 ~ 127    ☐ Class A
- 128 ~ 191    ☐ Class B
- 192 ~ 223    ☐ Class C
- 224 ~ 239    ☐ Class D
- 240 ~ 255    ☐ Class E

**Question: Find the class of each address.**

- a. 227.12.14.87
- b. 193.14.56.22
- c. 14.23.120.8
- d. 252.5.15.111
- e. 134.11.78.56

**Answer:-** [click here for details](#)

- a. The first byte is 227 (between 224 and 239); the class is D.
- b. The first byte is 193 (between 192 and 223); the class is C.
- c. The first byte is 14 (between 0 and 127); the class is A.
- d. The first byte is 252 (between 240 and 255); the class is E.
- e. The first byte is 134 (between 128 and 191); the class is B.

**Question: Change the following IP addresses from binary notation to dotted-decimal notation.**

- a. 10000001 00001011 00001011 11101111
- b. 11000001 10000011 00011011 11111111
- c. 11100111 11011011 10001011 01101111
- d. 11111001 10011011 11111011 00001111

**Answer:-** [click here for details](#)

We replace each group of 8 bits with its equivalent decimal number (see Appendix B) and add dots for separation:

- a. 129.11.11.239



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- b. 193.131.27.255
- c. 231.219.139.111
- d. 249.155.251.15

**Question: Find the error, if any, in the following IP addresses:**

- a. 111.56.045.78
- b. 221.34.7.8.20
- c. 75.45.301.14
- d. 11100010.23.14.67

**Answer:-** [click here for details](#)

- a. There are no leading zeroes in dotted-decimal notation (045).
- b. We may not have more than four numbers in an IP address.
- c. In dotted-decimal notation, each number is less than or equal to 255; 301 is outside this range.
- d. A mixture of binary notation and dotted-decimal notation is not allowed.

**Question: What is the concept of IP Address Hierarchy? 3**

**Answer:-** (Page85 )

The IP address hierarchy guarantees two important principles:

1. Each computer is assigned a unique address.
2. Although network number assignment must be coordinated globally, suffixes can be assigned locally.

**Question: What is standard type of frame in Ethernet?**

**Answer:-** (Page 27)

802.3 define by IEEE

**Question: What happed datagram larger than MTU?**

**Answer:-** (Page 108)

Router detects datagram larger than network MTU and then it splits into pieces and each piece is smaller than outbound network MTU.

**Question: What mechanism is used by TCP?**

**Answer:-** (Page 125)

TCP achieves reliability by mechanism of retransmission. An acknowledgement is used to verify that data has arrived successfully. If acknowledgement does not arrive, the previous data is retransmitted.



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**Question: Where ICMP message should be sent?**

**Answer:- (Page 117)**

ICMP message is sent in response to incoming datagrams with problems. ICMP message is not sent for ICMP message.

**Question: EGP and IGP are the types of what?**

**Answer:- (Page 135)**

There are two broad classes of Internet Routing Protocol.

**INTERIOR GATEWAY PROTOCOLS (IGPs):**

It is used among routers within autonomous system. The destinations lie within IGP.

**EXTERIOR GATEWAY PROTOCOLS (EGPs):**

It is used among autonomous systems. The destinations lie throughout Internet.

**Question: Mention the qualities of server which differentiate it from the client?**

**Answer:- (Page 146)**

"It is a special-purpose, privileged program.

"It is dedicated to provide one service.

"It can handle multiple remote clients simultaneously. "It invoked automatically when system boots.

"It executes forever.

"It needs powerful computer and operating system. "It waits for client contact.

"It accepts requests from arbitrary clients.

**Question: Packet is independent of source address? Give two advantages of this property? 2 marks**

**Answer:- (Page 58)**

It has several benefits. It allows fast and efficient routing. Packet switch need not have complete information about all destinations in spite it just has next hop so reduces total information and increases dynamic robustness. The network can continue to function even if topology changes without notifying entire network.

**Question: Which NAT variant fails if application uses IP Address instead of Domain? 2 marks**

**Answer:- (Page 132)**

Twice Nat



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**Question: If company wants to shift from IPV4 to IPV6 which type of IPV6 notation it uses? 3 marks**

**Answer:- (Page 114)**

128-bit addresses unwieldy in dotted decimal; requires 16 numbers:

105.220.136.100.255.255.255.255.0.0.18.128.140.10.255.255

Groups of 16-bit numbers in hex separated by colons - colon hexadecimal (or colon hex).

69DC: 8864:FFFF: FFFF: 0:1280:8C0A:FFFF

Zero-compression - series of zeroes indicated by two colons

FF0C: 0:0:0:0:0:0:B1

FF0C::B1

IPv6 address with 96 leading zeros is interpreted to hold an IPv4 address

**Question: Which gateway protocol is used by EGP? give its 2 Properties. ? 3 Marks**

**Answer:- (Page 138)**

**"Border Gateway Protocol (BGP)"**

"It provides routing among autonomous systems (EGP). "It provides policies to control routes advertised.

"It uses reliable transport (TCP).

**Question: In a shared network everybody wants to get the data, which strategy could be used to avoid conflict in Ethernet. 5 marks**

**Answer:- (Page 28)**

There is no central control management when computers transmit on Ethernet.

For this purpose the Ethernet employs CSMA to coordinate transmission among multiple attached computers. CSMA is a coordination scheme that defines how to take turns using a shared cable.

Computer that detects a collision sends special signal to force all other interfaces to detect collision.

Computer then waits for other to be idle before transmission. But if both computers wait for same length of time, frames will collide again. So the standard specifies maximum delay and both computers choose random delay, which is lesser. After waiting, computers use carrier sense to avoid subsequent collision. The computer with shorter delay will go first and other computer may transmit later.

**Question: Which device is used when IP Address interacts with global internet, describe all steps? 5 marks**

**Answer:- (Page 135)**

**ROUTING IN THE GLOBAL INTERNET**

As the route information protocol allows one router to exchange routing information with another, however this scheme cannot scale to the entire Internet because, if all routers attempted to exchange





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information, the resulting traffic would overwhelm the backbone networks. To solve the problem the routers and networks in the Internet are divided into groups. All routers within a group exchange routing information.

Then at least one router in the group summarizes information before sending it to other groups.

**Question: As IT student do you think that common networking tool such as Ping will work with IPv6?**

**Answer:- (Page 117)**

Yes Ping will work with IPv6, An Internet host A, is reachable from another host B, if datagrams can be delivered from A to B. Ping program tests reachability. It sends datagram from B to A, that echoes back to B. it uses ICMP echo request and echo reply messages. Internet layer includes code to reply to incoming ICMP echo request messages.

**Question: Make Network of 7 computers. Which is best suitable topology if demand is that the network must be centrally manageable? Justify it with 4 possible advantages.**

**Answer:- (Page )**

Star

**Question: Packet lost. How to overcome such traffic situation? Consequence face if it is not resumed carefully?**

**Answer:- (Page 128)**

The goal of congestion control is to avoid adding retransmissions to an already congested Reducing the window size quickly in response to the lost messages does it. It is assumed that loss is due to congestion. We have to resume carefully. Otherwise the network will swing wildly between congestion and under utilization.

**Question: Which Gateway protocol has characteristics of unreliable transport?**

**Answer:- (Page 138)**

RIP has characteristics of unreliable transport. And reason is because it uses UDP.

**Question: Assume a multinational organization has very large computer network across the country. Network engineer is given a task to configure a protocol to manage routing information in this network. In this scenario which protocol will be configured? Briefly explain proper reason.**

**Answer:- (Page 138)**

BGP is best for large network across country.



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It is most popular Exterior Gateway Protocol in Internet. It has following characteristics:

- "It provides routing among autonomous systems (EGP).
- "It provides policies to control routes advertised.
- "It uses reliable transport (TCP).
- "It gives path of autonomous systems for each destination.
- "Currently the EGP is of choice in the Internet.
- "The current version is four (BGP-4).
- "It provides facilities for Transit Routing.

**Question: Reliability is responsibility of which layer in TCP/IP. Which protocol is designed to provide reliable transport service and why reliability is needed?**

**Answer:- (Page 123)**

**THE NEED FOR RELIABLE TRANSPORT:**

Reliability is fundamental in a computer system. Software in the Internet must provide the same level of reliability as a computer system. Software must guarantee prompt and reliable communication without any loss, duplication, and change in the order.

**TRANSMISSION CONTROL PROTOCOL:**

Reliability is the responsibility of the Transport layer. In TCP/IP, TCP provides reliable transport service. Most Internet applications use TCP as no other protocol has proved to work better.

**SERVICE PROVIDED BY TCP:**

Following are the services provided by TCP:

- Connection-oriented service
- Point-to-point
- Complete reliability
- Full-duplex communication
- Stream interface
- Reliable connection startup
- Graceful connection shutdown

**Question: Difference between UDP and TCP.**

**Answer:- (Page 120,122)**

UDP is less complex and easier to understand. It does not provide the type of service a typical application expects.

TCP is the major transport protocol in the TCP/IP suite. It uses unreliable datagram service offered by IP when sending data to another computer. It provides reliable data delivery service to applications.



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**IT engineers wants to build four physical networks to connect with internet without using web netting. If he has three different public IP addresses for these networks, can he assign one IP address to two different networks due to shortage of IP address? Support your answer with reason.**

**Answer:- (Page 129)**

Yes we can by using NETWORK ADDRESS TRANSLATION (NAT). It allows multiple computers to share a single address. It require device to perform packet translation.

Its implementations are available e.g.,

- Stand-alone hardware device
- IP router with NAT functionality embedded

**NAT EXAMPLE:**

For example, a site uses private network 10.0.0.0/8 internally.

First computer is assigned 10.0.0.1, second computer is assigned 10.0.0.2 and so on...

Site obtains a valid IP address (e.g. 128.210.24.6). Let's assume that the computer 10.0.0.1 sends to 128.211.134.4 (another global IP address). NAT translates the IP source address of the outgoing datagram to the global IP address. NAT also translates the destination address of incoming datagram to the private site address. It is shown in the figure below.



**Suppose ABC University has different heterogeneous computer networks where fragmentation technique is used to solve the problem of varied networks. How does it work with different MTU sizes data gram? Justify your answer with at least five solid reasons.**

**Answer: (Page 108)**

One technique is to limit datagram size to smallest MTU of any network. IP uses fragmentation i.e. datagrams can be split into pieces to fit in network with small MTU.

Router detects datagram larger than network MTU and then it splits into pieces and each piece is smaller than outbound network MTU.



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Each fragment is an independent datagram. It includes all header fields. Bit in header indicates that the datagram is a fragment. Other fields have information for reconstructing original datagram. Fragment offset gives original location of fragment.

Router has local MTU to computer size of each fragment. It puts part of data from original datagram in each fragment and puts other information into header.

**Suppose an organization has more than one autonomous system where EGP is used to exchange routing information between networks. Justify with reasons why EGP does not use routing metrics? Briefly explain with an example**

**Answer:** [click here for details](#)

EGP does not use routing metrics—it simply keeps track of which networks are currently reachable through a given router.

EGP can only report the existence of path and not its cost.

The Exterior Gateway Protocol (EGP) is an exterior routing protocol used for exchanging routing information with gateways in other autonomous systems. Unlike interior protocols, EGP propagates only reachability indications, not true metrics. EGP updates contain metrics, called *distances* which range from 0 to 255. GateD will only compare EGP distances learned from the same AS.

Before EGP sends routing information to a remote router, it must establish an adjacency with that router. This is accomplished by an exchange of *Hello* (not to be confused with the HELLO protocol, or OSPF HELLO messages) and *I Heard You* (I-H-U) messages with that router. Computers communicating via EGP are called EGP *neighbors*, and the exchange of HELLO and I-H-U messages is referred to as *acquiring a neighbor*. Once the neighbor is acquired, the system *polls* the neighbor for routing information. The neighbor responds by sending an *update* containing routing information. If the system receives a poll from its neighbor, it responds with its own update packet. When the system receives an update, it includes routes from the update into its routing database. If the neighbor fails to respond to three consecutive polls, Gate D assumes that the neighbor is down and removes the neighbor's routes from its database.

**Network Administrator wants to assign three IP addresses on different host in a network each address starts with 0 bit write a class to which ip address is belongs.**

**Answer:** [\(click here for details\)](#)

The class A addresses, 0 and 127, that are reserved for special use. Network 0 designates the *default route* (is used to simplify the routing information that IP must handle) and network 127 is the *loopback address* (simplifies network applications by allowing the local host to be addressed in the same manner as a remote host). We use the special network addresses when configuring a host.



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**Network administrator wants to implement an ARP Technique in which all hosts calculate their own tables. Just enlist its name.**

**Answer: (Page 96)**

A simple Boolean ‘and’ operation can compute the computer’s hardware address.

**Which type of network address translation devices is available?**

**Answer: (Page )**

NAT translates the IP source address of the outgoing datagram to the global IP address. NAT also translates the destination address of incoming datagram to the private site address. (Not sure)

**Which standard will be implemented to improve the computational efficiency of table lookup method for address resolution? List the names and discuss each.**

**Answer: (Page 94)**

There are two standard implementations to improve computational efficiency:

- Hashing
- Direct indexing

**HASHING:**

Hashing is the transformation of a string of characters into a usually shorter fixed-length value or a key that represents the original string. Hashing is used to index and retrieve items in a database because it is faster to find the item using the shorter hashed key than to find it using the original value. It is also used in many encryption algorithms.

**DIRECT INDEXING:**

It is less generally known technique. It is possible only in cases where protocols address are assigned from a compact range.

**Suppose XYZ compute networks in its different departments where UDP is preferred for communication. You are required to enlist any five characteristics of UDP:**

**Answer: (Page 120)**

**CHARACTERISTICS OF UDP:**

UDP has the following characteristics.

- It is an end-to-end protocol or It provides application-to-application communication.
- It provides connectionless service.
- It is a Message-Oriented protocol.
- It uses best-effort delivery service.
- It follows arbitrary interaction.



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Suppose a manufacturing organization has a network of 400 computers. Network engineer is given a task to track a problem whenever it happens in the network, to achieve this goal he prefers ICMP protocol. YOU are required to enlist any three types of error messages and two types of informational messages which are identified by internet control message protocol?

**Answer: (Page 115)**

Internet control Message Protocol (ICMP) defines error and informational messages. These are given as follows:

**1. ERROR MESSAGES:**

These are as follows:

- Source quench
- Time exceeded
- Destination unreachable
- Redirect
- Fragmentation required

**2. INFORMATIONAL MESSAGES:**

These are as follows:

- Echo request/reply
- Address mask request /reply
- Router discovery

**Why there is the need of autonomous system in internet?**

**Answer: (Page 135)**

An autonomous system can be thought of as a set of networks and routers under one administrative authority. The term is flexible. It can be or correspond to an entire intuition or a single corporation. It is needed because no routing protocol can scale to entire Internet.

**UDP characteristics with example.**

**Answer: (Page 120)**

**CHARACTERISTICS OF UDP:**

UDP has the following characteristics.

- It is an end-to-end protocol. It provides application-to-application communication.
- It provides connectionless service.
- It is a Message-Oriented protocol.
- It uses best-effort delivery service.
- It follows arbitrary interaction.
- It is operating system independent.



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### EXAMPLES:

- Audio transmission
- On-line shopping application

Give the address 130.4.102.1/24, find the number of subnet bits? (2 Marks)

Answer:-

The screenshot shows a Google Books search result for the query "Give the address 130.4.102.1/24, find the number of subnet bits?". The table displayed is titled "Table 12-13 Five Examples of Addresses/Masks, with the Number of Network, Subnet, and Host Bits".

Address	8.1.4.5/16	130.4.102.1/24	199.1.1.100/24	130.4.102.1/22	199.1.1.100/27
Mask	255.255.0.0	255.255.255.0	255.255.255.0	255.255.252.0	255.255.255.224
Number of Network Bits	8	16	24	16	24
Number of Host Bits	16	8	8	10	5
Number of Subnet Bits	8	8	0	6	3
Number of Hosts Per Subnet	$2^{16} - 2$ , or 65,534	$2^8 - 2$ , or 254	$2^8 - 2$ , or 254	$2^{10} - 2$ , or 1022	$2^5 - 2$ , or 30
Number of Subnets	$2^8$ , or 256	$2^8$ , or 256	0	$2^6$ , or 64	$2^3$ , or 8

Some connections are connection less while other are connection oriented. UDP belongs to which category?(2)

Answer: (Page 120)

UDP belongs to connectionless service.





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**ELEMENT ENFORCE IPv4 to be changed give a solid reason why IPv4 need to be changed?**

**Answer: (Page 110)**

One of the parameters, which motivated IP for change, is address space. The 32-bit address space allows for over a million networks. But most networks are class C and too small for many organizations. 214 class B network addresses already almost exhausted (and exhaustion was first predicted to occur, a couple of years ago).

The second parameter is type of service, the IP provides. Different applications have different requirements for delivery reliability and speed. Current IP has type of service that is not often implemented. Another factor for the motivation for change is multicast.

**Write the name of Address resolution algorithms?**

**Answer: (Page 93)**

TABLE LOOK UP

CLOSE FORM COMPUTATION

MESSAGE EXCHANGE

**Which approach of error detection is able to detect more errors as compared to others?  
Considering that there should be no increase in the size of information being transmitted.  
Explain how it works?**

**Answer: (Page 20)**

To enable a network system to detect more error without increasing the amount of information in each packet another most successful approach is made which is called CRC.

**In real world, usually private IP address interacts with global internet. In this situation, discuss which type of device will be used to handle the traffic. Explain working with proper steps.**

**Answer: (Page 135)**

EXTERIOR GATEWAY PROTOCOLS (EGPs):

It is used among autonomous systems. The destinations lie throughout Internet





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**IT officer want end-to-end delivery service. Would it be connectionless or connection oriented. Write two features of selected protocol. [3 marks]**

**Answer: (Page )**

End-to-end delivery service is connection less. The main features of connectionless service are as follows:

It includes extension of LAN abstraction. It has universal addressing and the data is delivered in packets (frames), each with a header. It combines collection of physical networks into a single virtual network.

Connectionless data delivery (UDP)

The User Datagram Protocol

- Connection-less Paradigm
- Message Oriented Interface
- UDP Communication Semantics

**XYZ organization wants to open a new chain of franchises in Multan where heavy traffic will be transferred for communication. Network administrator want to use multiple routers without any cost issue for connectivity of each franchise. Is it better option to use multiple routers? Support your answer with proper reason. [3 marks]**

**Answer: (Page 135)**

As the route information protocol allows one router to exchange routing information with another, however this scheme cannot scale to the entire Internet because, if all routers attempted to exchange information, the resulting traffic would overwhelm the backbone networks. To solve the problem the routers and networks in the Internet are divided into groups. All routers within a group exchange routing information.

Then at least one router in the group summarizes information before sending it to other groups.

**First four bits of IP are 1111, to which class IP address belongs? [2 marks]**

**Answer: [click here for details](#)**

If the first four bits of an IP address are 1111, the address belongs to a class E block



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**Describe how NAT can be useful for residence with cable modem or DSL?**

**Answer:** [\(Page 133\)](#)

NAT is useful at a residence with Cable Modem or DSL connectivity as it allows the customer to have multiple computers at home without requiring an IP address for each of them. Instead a single IP address is used for all the computers. NAT software allows a PC to connect with the Internet and act as a NAT device at the same time.

**How are lost acknowledgment and a lost frame handled at the sender site? [5]**

**Answer:** [\(Page 125\)](#)

TCP achieves reliability by retransmission. An acknowledgement is used to verify that data has arrived successfully. If acknowledgement does not arrive, the previous data is retransmitted.

**If physical layer not understand the datagram format, how data is transmitted? (2)**

**Answer:** [click here for details](#)

The physical layer is responsible for passing bits onto and receiving them from the connecting medium. This layer has no understanding of the meaning of the bits, but deals with the electrical and mechanical characteristics of the signals and signaling methods. For example, it comprises the RTS and CTS signals in an RS-232 environment, as well as TDM and FDM techniques for multiplexing data on a line. Using TCP/IP as a model, the sending application hands data to the transport layer, which breaks it up into the packets required by the network. It stores the sequence number and other data in its header. The network layer adds source and destination data in its header, and the data link layer adds station data in its header. On the other side, the corresponding layer reads and processes the headers and discards them.

**If some packet has some error, which IP datagram header field indicates you about error?**

**Answer:** [click here for details](#)

HEADER CHECKSUM field of IP data gram header will indicate about errors.

**What mechanisms can a host to determine the path MTU? (3)**

**Answer:** [\(Page 113\)](#)

Source determines path MTU. The smallest MTU on any network between source and destination and it fragments datagram to fit within that MTU. The process of learning the path MTU is known as path MTU discovery. Path MTU discovery is used. Source sends probe message of various sizes until destination reached. It must be dynamic i.e. path may change during transmission of datagrams.



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**Differentiate between routing techniques used within the autonomous system and outside of the autonomous system? (5)**

**Answer: (Page 135)**

There are two broad classes of Internet Routing Protocol:

**INTERIOR GATEWAY PROTOCOLS (IGPs):**

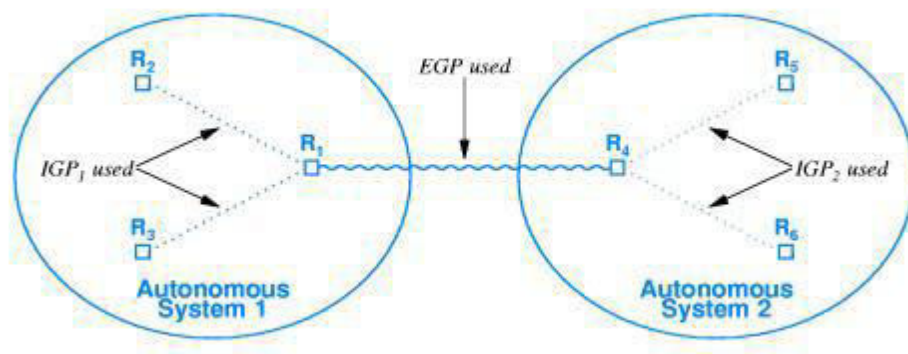
It is used among routers within autonomous system. The destinations lie within IGP.

**EXTERIOR GATEWAY PROTOCOLS (EGPs):**

It is used among autonomous systems. The destinations lie throughout Internet

**ILLUSTRATION OF IGP/EGP USE:**

The following figure illustrates the IGP/EGP use.



**How does ICMP define error and informational messages? (5)**

**Answer: (Page 116)**

Internet control Message Protocol (ICMP) defines error and informational messages. These are given as follows:

**1. ERROR MESSAGES:**

These are as follows:

- Source quench
- Time exceeded
- Destination unreachable
- Redirect
- Fragmentation required

**2. INFORMATIONAL MESSAGES:**

These are as follows:

- Echo request/reply
- Address mask request /reply
- Router discovery



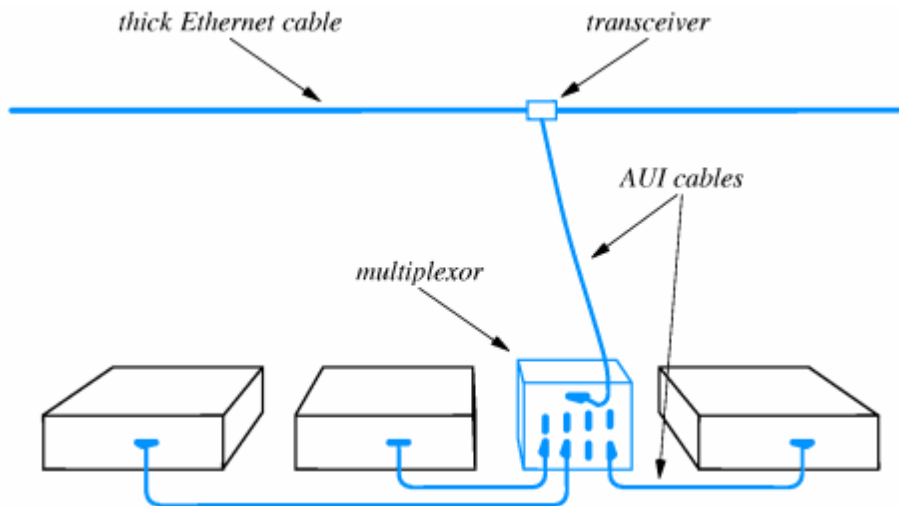
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**What do we mean by connection multiplexing in connection between NIC and physical network? (5)**

**Answer: (Page 41)**

In some circumstances transceiver may be in convenient e.g. workstations in a LAN. Connection multiplexer connects multiple computers to a single transceiver. Each computer's AUI cable connects to connection multiplexer. One AUI from multiplexer to Ethernet coax. Connection multiplexing is shown in the figure below.



**Network engineer works to analyze performance which two types of characteristic will be used to check network performance (Marks 2)**

**Answer: (Page 79)**

There are two types of characteristics in case of network performance.

- Delay
- Throughput

**What are major problem in User Datagram Protocol (UDP) due to which we need Transmission control Protocol (TCP) (Marks 2)**

**Answer: (Page 120)**

- Each UDP message must fit into a single IP datagram.
- It can result to an inefficient use of the underlying network.



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**Why RIP cannot span to large network? Explain it with which other IGP is used for this purpose (Marks 5)**

**Answer:** (Page 138)

Because RIP is used over LAN and it is used for routing within an autonomous system (IGP).

**What is Difference between internet protocol(IP) and transport protocol(TCP)? (2)**

**Answer:** (Page 119, [click here for details](#) )

**Internet Protocol:**

A set of rules governing the format of data sent over the Internet or other network. The **Internet Protocol (IP)** is the principal communications protocol in the Internet protocol suite for relaying datagrams across network boundaries. Its routing function enables internetworking, and essentially establishes the Internet.

IP, as the primary protocol in the Internet layer of the Internet protocol suite, has the task of delivering packets from the source host to the destination host solely based on the IP addresses in the packet headers. For this purpose, IP defines packet structures that encapsulate the data to be delivered. It also defines addressing methods that are used to label the datagram with source and destination information.

**Transport protocol:**

Internet protocol cannot distinguish between application programs running on the same computer. Fields in the IP datagram header refer to computers, not applications. A protocol that allows an application program to serve as the end point of communication is known as a transport protocol or an end-to-end protocol.

**How can we identify the bad frame in the networking? (2)**

**Answer:** (Page 18)

To detect and correct errors, frames include additional information, which is inserted by the sender and checked by the receiver. In this way incorrect data can be rejected. Also the incorrect data can be corrected and accepted. To detect the error there are different schemes in which:

- Parity checking
- Checksum
- Cyclic Redundancy Check (CRC)



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**Network engineer is using routers to send some important datagram to another network. Which IPV6 header field will be used there? (2)**

**Answer:** [\(Page 111\)](#)

Additional information is stored in optional extension headers, followed by data.

**Which types of protocol is used to access specific application from machine? (3)**

**Answer:** [\(Page 119\)](#)

**TRANSPORT PROTOCOLS:**

- Provide application-to-application communication.
- Need extended addressing mechanisms to identify applications.
- Are called end-to-end communication.

**IP datagram format is same as a hardware frame format. Can network engineer change the size of IP datagram header? (3)**

**Answer:** [click here for details](#)

No, IP datagram format is not same as hardware frame format. Network engineer can't change the size of header because header area is usually fixed size.

**If there is no signal, how sever come to know there is communication arrived. (3 Marks)**

**Answer:-** [click here for details](#)

Instead for waiting for an arbitrary message to arrive, an application that accepts communication must interact with protocol software before an external source attempts to communicate.

**Which protocol is used that can hold data in buffer in both directions sent and received both?**

**Answer:-** [click here for details](#)

This service is provided by Transmission Control Protocol (TCP). In TCP a connection can be used to carry data in both directions, that is, it is "full duplex".

**Write multiple technologies in networking field where change in routing table can happen frequently; does a router in the global Internet can still use static routing?**

**Answer:-** [click here for details](#)



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Imagine a small organization that is a customer of only an ISP. (Not have multiple internet connections), All traffic leaving the customer's site through router must travel to the ISP. Because route never changes, the routing table in router of customer can be static.

#### **What are the operations of network sniffer?(3)**

**Answer:** (Page 37)

A network analyzer also called network monitor or a network sniffer is used to examine the performance of or debug a network.

It can report statistics such as capacity utilization, distribution of frame size, collision rate or token circulation time.

#### **How congestion is controlled by TCP?(5)**

**Answer:** [click here for details](#)

TCP uses a congestion window in the sender side to do congestion avoidance. The congestion window indicates the maximum amount of data that can be sent out on a connection without being acknowledged. TCP detects congestion when it fails to receive an acknowledgement for a packet within the estimated timeout. In such a situation, it decreases the congestion window to one maximum segment size (MSS), and under other cases it increases the congestion window by one MSS. There also exists a congestion window threshold, which is set to half the congestion window size at the time when a re-transmit was required.

#### **Which characteristics OSPF have? (5)**

**Answer:** (Page 140)

##### **OSPF has following characteristics:**

###### **"ROUTING WITHIN AN AUTONOMOUS SYSTEM:**

OSPF has designed as an Interior Gateway Protocol used to pass routing information among routers within an autonomous system.

###### **"FULL CIDR AND SUBNET SUPPORT:**

OSPF includes a 32-bit address mask with each address, which allows the address to be classful, classless, or subnetted.

###### **"AUTHENTICATED MESSAGE EXCHANGE:**

A pair of routers using OSPF can authenticate each message to ensure that messages are only accepted from a trusted source.

###### **"IMPORTED ROUTES:**

OSPF allows a router to introduce routes learned from another means (e.g., from BGP).



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**"LINK-STATE ALGORITHM:**

OSPF uses link-state routing.

**"SUPPORT FOR MULTI-ACCESS NETWORKS:**

Traditional link state routing is inefficient across a multi-access network, such as an Ethernet, because all routers attached to the network broadcast link status. OSPF optimizes by designing a single router to broadcast on the network.

**Differentiate between NAT and NAPT? Marks 2**

[Answer: \(Page 133\)](#)

**NETWORK ADDRESS TRANSLATION:**

It is the extension of original addressing scheme and was motivated by exhaustion of IP address space. It allows multiple computers to share a single address. It requires device to perform packet translation.

Its implementations are available e.g.,

- Stand-alone hardware device
- IP router with NAT functionality embedded

**NETWORK ADDRESS AND PORT TRANSLATION (NAPT):**

It is by far the most popular form of NAT that can change TCP or DP protocol port numbers as well as IP addresses.

It allows multiple computers at site to communicate with single destination as well as multiple users on given computer to communicate with same destination.

**Can we use ATM for LAN and WAN? If yes then what type of connection established?**

[Answer: \(Page 66\)](#)

LANs and WANs can both connect multiple computers, but they have different base technologies and meet different goals. ATM is a single technology that is designed to meet the goals of both LANs and WANs.

ATM uses the concept of connection-oriented networking.

**Is Link state better than Distance vector? If yes then explain reason (3marks)**

[Answer: \(Page \)](#)





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Link state is better than Distance vector because, if a network is huge it is better to use link state than distance vector, because there are more limitations in distance vector like Hop count limit etc.

- Switches perform independent computations.
- It is used in OSPF.

**Which characteristics of IP multicast make it unique?**

**Answer:** [Click here for detail](#)

We assume that IP multicast is more beneficial for the channels with a high popularity, and therefore these channels will be preferred when the number of available multicast groups is smaller than the number of channels.

**What are the main drawbacks of routing information protocol?**

**Answer:** [click here for details](#)

The protocol is limited to networks whose longest path involves 15 hops. The designers believe that the basic protocol design is inappropriate for larger networks. Note that this statement of the limit assumes that a cost of 1 is used for each network. This is the way RIP is normally configured. If the system administrator chooses to use larger costs, the upper bound of 15 can easily become a problem.

- The protocol depends upon "counting to infinity" to resolve certain unusual situations. (This will be explained in the next section.) If the system of networks has several hundred networks, and a routing loop was formed involving all of them, the resolution of the loop would require either much time (if the frequency of routing updates were limited) or bandwidth (if updates were sent whenever changes were detected). Such a loop would consume a large amount of network bandwidth before the loop was corrected.

We believe that in realistic cases, this will not be a problem except on slow lines. Even then, the problem will be fairly unusual, since various precautions are taken that should prevent these problems in most cases.

- This protocol uses fixed "metrics" to compare alternative routes. It is not appropriate for situations where routes need to be chosen based on real-time parameters such as a measured delay, reliability, or load. The obvious extensions to allow metrics of this type are likely to introduce instabilities of a sort that the protocol is not designed to handle.

**When IPv4 is working well why does everyone want to use IPv6?**

**Answer:** (Page 110)



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One of the parameters, which motivated IP for change is address space. The 32-bit address space allows for over a million networks. But most networks are class C and too small for many organizations. 2<sup>14</sup> class B network addresses already almost exhausted (and exhaustion was first predicted to occur, a couple of years ago).

The second parameter is type of service, the IP provides.

Different applications have different requirements for delivery reliability and speed.

Current IP has type of service that is not often implemented. Another factor for the motivation for change is multicast.

**In case of UDP describe endpoint identification with protocol port number?**

[Answer: \(Page 121\)](#)

Yes, UDP identifies an application as an endpoint with protocol port number.

**What will happen if delimiters is not included in frame format?**

[Answer: \(Page 16\)](#)

- Missing eot indicates sending computer crashed.
- Missing soh indicates receiving computer missed beginning of message.
- Bad frame is discarded.

**Network administrator receives some messages. How does computer deal this incoming ARP messages?**

[Answer: \(Page \)](#)

**IDENTIFYING ARP RESPONSES:**

Let's find out how a computer knows whether an incoming frame contains an ARP message. The type field in the frame header specifies that the frame contain an ARP message. The Ethernet standard specifies that the type field in an Ethernet frame carrying an ARP message must contain the hexadecimal value 0x806, as shown in the figure below.

Dest. Address	Source Address	Frame Type	Data In Frame
		806	complete ARP message



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**In which case pseudo header is used in UDP? (2 marks)**

**Answer:** [click here for details](#)

The pseudo header is used only for this calculation and is then discarded; it is not actually transmitted. The UDP software in the destination device creates the same pseudo header when calculating its checksum to compare to the one transmitted in the UDP header.

**Why OSPF is more feasible as compare to other IGP for globule internet? (3 marks)**

**Answer:** (Page 140)

"FULL CIDR AND SUBNET SUPPORT:

OSPF includes a 32-bit address mask with each address, which allows the address to be classful, classless, or subnetted.

"AUTHENTICATED MESSAGE EXCHANGE:

A pair of routers using OSPF can authenticate each message to ensure that messages are only accepted from a trusted source.

"IMPORTED ROUTES: OSPF allows a router to introduce routes learned from another means (e.g., from BGP).

"SUPPORT FOR MULTI-ACCESS NETWORKS:

Traditional link state routing is inefficient across a multi-access network, such as an Ethernet, because all routers attached to the network broadcast link status. OSPF optimizes by designing a single router to broadcast on the network.

OSPF allows subdivision of Autonomous System into areas. The link-status information is propagated within an area. The routes are summarized before being propagated to another area. It reduces overhead (less broadcast traffic). Because it allows a manager to partition the routers and networks in an autonomous system into multiple areas, OSPF can scale to handle a larger number of routers than other IGPs.

**If you receive an IP datagram, which IP datagram header field indicates you that datagram is fragmented or complete. (2)**

**Answer:** [click here for details](#)

Each fragment is an independent datagram. It includes all header fields. Bit in header indicates that the datagram is a fragment. The more fragments bit = 0, so the data is not fragmented.

**Which fields in the IP datagram always change from one datagram to the next within this series of ICMP messages sent by your computer?**

**Answer:** [click here for details](#)

Identification, Time to live and Header checksum always change.



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**Network engineer wants to analyze network performance. Which two types of characteristics will be used to check network performance? (2)**

**Answer: (Page 79)**

There are two types of characteristics in case of network performance.

- Delay
- Throughput

**What is purpose of multicasting? (3)**

**Answer: (Page 35)**

It is the restricted form of broadcasting. It works like broadcasting however it does not forward frames automatically to the CPU.

The interface hardware is programmed in advance to accept certain frames that have multicast address as the destination address.

If an application program wishes to receive certain frames then it program the interface hardware to accept an additional set of addresses.

The interface hardware frame then begins accepting three types of frames:

- Multicast frames
- Broadcast frames
- The frames that are destined to the station itself.

**Does TCP/IP protocol suite include an ARP? If yes, then how many types of messages are used in ARP?**

**Answer: (Page 97)**

The TCP/IP protocol suite includes an Address Resolution Protocol (ARP).

The ARP standard defines two basic message types:

- Request
- Response

**REQUEST:**

This contains an IP address and requests the corresponding hardware address.

**RESPONSE:**

This contains both the IP address sent in the request and the hardware address.



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**Does UDP offer the message oriented interface and why it is useful for it? (3)**

**Answer:** [\(Page 119\)](#)

UDP offers Connectionless data delivery. UDP is the first of the transport protocols in TCP/IP protocol suite. UDP protocol allows applications on the computers to send and receive datagrams. UDP has a packet format. It uses best-effort delivery service.

**As an IT student, you have a sound knowledge on IPv4 and IPv6. What are the similarities do you find b/w them? Support your answer with three similarities. (5)**

**Answer:** [click here for details](#)

Both are versions of internet protocol (IP) they both have private IP addressing, They both allow multicast. There are many conceptual similarities between IPv4 and IPv6 network operation. Addresses still have a network prefix portion (subnet) and a device interface specific portion (host). While the length of the network portion is still variable. One of the similarities is they both use DNS. DNS is an important part of communicating data on the internet or on a private network

**What is the difference between IPv4 and IPv6?**

**Answer:** [click here for details](#)

IPv6 is based on IPv4, it is an evolution of IPv4. So many things that we find with IPv6 are familiar to us. The main differences are: 1. Simplified header format. IPv6 has a fixed length header, which does not include most of the options an IPv4 header can include. Even though the IPv6 header contains two 128 bit addresses (source and destination IP address) the whole header has a fixed length of 40 bytes only. This allows for faster processing. Options are dealt with in extension headers, which are only inserted after the IPv6 header if needed. So for instance if a packet needs to be fragmented, the fragmentation header is inserted after the IPv6 header. The basic set of extension headers is defined in RFC 2460.

2. Address extended to 128 bits. This allows for hierarchical structure of the address space and provides enough addresses for almost every 'grain of sand' on the earth.

3. A lot of the new IPv6 functionality is built into ICMPv6 such as Neighbor Discovery, Auto configuration, Multicast Listener Discovery, Path MTU Discovery.

4. Enhanced Security and QoS Features. Answer: IPv4 means Internet Protocol version 4, whereas IPv6 means Internet Protocol version 6. IPv4 is 32 bits IP address that we use commonly, it can be 192.168.8.1, 10.3.4.5 or other 32 bits IP addresses. IPv4 can support up to 2<sup>32</sup> addresses, however the 32 bits IPv4 addresses are finishing to be used in near future, so IPv6 is developed as a replacement.

5. An IP address is binary numbers but can be stored as text for human readers. For example, a 32-bit numeric address (IPv4) is written in decimal as four numbers separated by periods. Each number can be zero to 255. For example, 1.160.10.240 could be an IP address.



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6. IPv6 addresses are 128-bit IP address written in hexadecimal and separated by colons. An example IPv6 address could be written like this: 3ffe:1900:4545:3:200:f8ff:fe21:67cf. IPv6 has a larger addressing space; IPv6 addresses use 128 bits instead of 32 bits.

**Is NAT beneficial? Explain it with at least two real world examples. (5)**

**Answer:** [\(Page 132\)](#)

It is by far the most popular form of NAT that can change TCP or DP protocol port numbers as well as IP addresses.

It allows multiple computers at site to communicate with single destination as well as multiple users on given computer to communicate with same destination.

Cable Modem or DSL connectivity.

**In star organization there are 120 systems connected in a network then Delay should be smaller or larger ?**

**Answer:** [\(Page \)](#)

Here the number 120 shows a large number of systems for a normal size of network that may cause problem like congestion, delay and jitter but 120 not always means that it can cause such problems like what if a much powerful switching system with higher bandwidth is available. So the question statement is a little confusing, simply if we say that a larger no of systems for a network are there it may be understandable.

**How ICMP can be used to test different tools? [3]**

**Answer:** [click here for details](#)

IP provides best-effort delivery. Delivery problems can be ignored; datagrams can be ‘dropped on the floor’. Internet Control Message Protocol (ICMP) provides error-reporting mechanism. The Internet Protocol (IP) is not designed to be absolutely reliable. The purpose of the ICMP messages is to provide feedback about problems in the communication environment, not to make IP reliable. There are still no guarantees that a datagram will be delivered or a control message will be returned. Some datagrams may still be undelivered without any report of their loss. The higher level protocols that use IP must implement their own reliability procedures if reliable communication is required.

ICMP uses the basic support of IP as if it were a higher level protocol. However, ICMP is actually an integral part of IP and must be implemented by every IP module.

ICMP suppose to be a relatively simple protocol, but it can be altered to act as a conduit for evil purpose. It is therefore important to understand how this protocol can be used for malicious purposes.



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The Internet Control Message Protocol (ICMP) is used to handle errors and exchange control messages. ICMP can be used to determine if a machine on the Internet is responding. To do this, an ICMP echo request packet is sent to a machine. If a machine receives that packet, that machine will return an ICMP echo reply packet. A common implementation of this process is the "ping" command, which is included with many operating systems and network software packages. ICMP is used to convey status and error information including notification of network congestion and of other network transport problems. ICMP can also be a valuable tool in diagnosing host or network problems.

Other RFCs have defined other functionalities for the ICMP:

- RFC 896 – Source Quench.
- RFC 950 – Address Mask Extensions.
- RFC 1191 – Path MTU Discovery.
- RFC 1256 – Router Discovery.
- RFC 1349 –Type of Service in the Internet Protocol Suite.

**How can a datagram be transmitted across a physical NW that does not understand the datagram format?**

Answer: [click here for details](#)

- A technique known as “encapsulation” is used
- IP encapsulation is similar to the encapsulation of ARP messages
- When an IP datagram is encapsulated in a frame
  - the entire datagram is placed in the data area of a frame

**How does IP SW reassemble fragments that arrive out of order?**

Answer: [click here for details](#)

- Unique identification number in the IDENTIFICATION field
- When a router fragments the datagram



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- the identification number is placed into each fragment
- A receiver uses the identification number and IP source address in an incoming fragment
  - to determine the datagram to which the fragment belongs
- The FRAGMENT OFFSET field tells a receiver how to order fragments within a given datagram

**Have any technique used for achieving reliability in TCP? [5] How a receiver knows that incoming data is datagram or other? 3 marks**

**Answer:** (Page 125, [click here for details](#) )

TCP achieves reliability by retransmission.

- The sender and receiver must agree on the value used in the frame type field



**Figure 21.1** An IP datagram encapsulated in a hardware frame. The entire datagram resides in the frame data area. In practice, the frame format used with some technologies includes a frame trailer as well as a frame header.

**What happens if a fragment eventually reaches another NW that has a smaller MTU?**

**Answer:** [click here for details](#)

- Another router along the path divides into smaller fragments





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- IP does not distinguish between original fragments and sub-fragments.
  - A receiver cannot know whether an incoming fragment was the result of one router fragmenting a datagram or multiple routers fragmenting fragments
- The advantage of making all fragments the same
  - is that a receiver can perform reassembly of the original datagram without first reassembling sub-fragments
    - doing so saves CPU time
    - and reduces the amount of information needed in the headers

**When one or more fragments from a datagram arrive, and some fragments are delayed or lost?**

**Answer:** [click here for details](#)

- we must save the fragments in case missing fragments are only delayed
- A receiver cannot hold fragments an arbitrarily long time because fragments occupy space in the receiver's memory
  - To avoid exhausting memory
    - IP specifies a maximum time to hold
  - When the first fragment arrives from a given datagram
    - the receiver starts a timer
  - If all fragments of a datagram arrive before the timer expires
    - the receiver cancels the timer and reassembles the datagram
  - If the timer expires before all fragments arrive
    - the receiver discards those fragments that have arrived

The result of IP's reassembly timer is all-or-nothing



**What is Extension Header in Ipv6? 3 Mark**

**Answer:** [click here for details](#)

Extra headers in the IPv6 datagram those provide additional functionality are called is Extension Header in Ipv6. Extension headers carry optional Internet Layer information, and are placed between the fixed header and the upper-layer protocol header.

**How long TCP should wait before retransmitting? 3 Mark**

**Answer:** (Page 125)

The time for acknowledgement to arrive depends on:

- Distance to destination
- Current traffic conditions

Multiple connections can be opened simultaneously. Traffic conditions change rapidly.

The retransmissions-times and the number of attempts isn't enforced by the standard. It is implemented differently by different operating systems, but the methodology is fixed.

The timeouts are measured in terms of the RTT (Round Trip Time) times. But this isn't needed very often due to Fast-retransmit which kicks in when 3 Duplicate ACKs are received.

**How can TCP monitor internet delays?**

**Answer:** [click here for details](#)

- TCP cannot know the exact delays for an internet at all times
- Instead, TCP estimates round-trip delay for each connection
- As it sends data packets and receives ACKs, TCP generates
  - a sequence of round-trip estimates
  - and uses a statistical function to produce a weighted average
- In addition to a weighted average
  - TCP keeps an estimate of the variance
- TCP adaptive RET works well:
  - Using the variance helps TCP react quickly when delay increases following a burst of packets
  - Using a weighted average helps TCP reset the RET timer
    - if the delay returns to a lower value after a temporary burst



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- When the delay remains constant
  - TCP adjusts the RET timeout to a value that is slightly longer than the mean round-trip delay
- When delays start to vary
  - TCP adjusts the RET timeout to a value greater than the mean to accommodate peaks

**Which wireless standard is used in WIFI technology?**

[Answer: \(Page 148\)](#)

IEEE 802.11 wireless standard is used in WIFI technology.

**What kind of information is in a routing table?**

[Answer: \(Page 58\)](#)

The process of forwarding the packets of information is called routing. The information about destinations is kept in routing tables.

**Define frames without type field?**

[Answer: \(Page 36\)](#)

Some LAN technologies do not include a type field.

Sender and receiver can agree on interpretation, which is as follows:

They agree on single data format and use only that format this limits to one type of data.

In this way all computers on LAN must use one format. Also they agree to encode the data format into first few bytes of the data field.

**What are the characteristics of the Border Gateway Protocol?**

[Answer: \(Page 138\)](#)

It is most popular Exterior Gateway Protocol in Internet. It has following characteristics:

"It provides routing among autonomous systems (EGP).

"It provides policies to control routes advertised.

"It uses reliable transport (TCP).

"It gives path of autonomous systems for each destination.



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"Currently the EGP is of choice in the Internet.

"The current version is four (BGP-4).

"It provides facilities for Transit Routing.

**How can we prove that we have 2.147.483.648 addresses in class A?**

**Answer:** [\(Page 88\)](#)

The relationship between classes and dotted decimal notation is given as follows.

In class A the three octets correspond to a host suffix.

In class B the last two octets are the host octets.

Class C has only one octet to represent the host.

The range of decimal values found in the first octet of each address class is given below in the figure.

Class	Range of Values
A	0 through 127
B	128 through 191
C	192 through 223
D	224 through 239
E	240 through 255

**What is meant by the client server paradigm?**

**Answer:** [click here for details](#)

It is used by all network applications. The passive program is called a server and the active program is called a client.

The client–server model of computing is a distributed application structure that partitions tasks or workloads between the providers of a resource or service, called servers, and service requesters, called clients. Often clients and servers communicate over a computer network on separate hardware, but both client and server may reside in the same system. A server host runs one or more server programs which share their resources with clients. A client does not share any of its resources, but requests a server's content or service function. Clients therefore initiate communication sessions with servers which await incoming requests.

Examples of computer applications that use the client–server model are Email, network printing, and the World Wide Web.

**In practice what are the three approaches used for datagram forwarding by multicast protocols?**

**Answer:** [click here for details](#)

- In practice, multicast protocols have followed three different approaches for datagram forwarding:



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- Flood-And-Prune
- Configuration-And-Tunneling
- Core-Based Discovery

**Why network administrator does not suggest fix timer transmission how any solution of this problem explains it with proper reason?**

**Answer:** (Page 126)

Setting a timer sounds so easy but the question is “what time interval?” If the time interval is too large, you are spending time waiting for something that is just not going to happen. If the time interval is too short, you will resend needlessly.

So keep estimate of round trip time on each connection, and use current estimate to set transmission timer. This is known as ‘Adaptive Retransmission’. This is a key to TCP’s success.

**Explain the class of address**

**Answer:** [click here for details](#)

IP addresses are organized into classes. For convenience of humans, IP addresses are expressed in the decimal format. Every number in each class is represented as binary to computers.

The four numbers in an IP address are known as ‘octets’. Each of them has eight bit positions. The octets are divided into two sections: Net and Host. The first octet represents Net for identifying the network and the Host contains the last octet. There are five IP classes.

**Class A:** The class A is used for very large networks. There are 1 to 126 are part of this class. That means there are 126 Class A networks. Class A networks accounts for half of the total available IP addresses.

**Class B:** It is used for medium size networks. The IP address with a first octet from 128 to 191 is part of this class. Class B networks have a first bit value of 1 and a second bit value of 0 in the first octet.

**Class C:** Class C is used for small to middle size networks. IP address with a first octet starts from 192-223. Class C networks have a first bit value of 1, second bit value of 1 and a third bit value of 0 in the first octet.

**Class D:** It has first, second and third bit value as 1 and the fourth bit as 0. The other 28 bits are used for identifying the group of computers which is intended for multicast messages.

**Class E:** Class E is used for identification purpose. The four bits value is 1. The other 28 bits are used for identifying the group of computers which is intended for multicast messages.



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**In which process backward compatibility of 10-base-t is done**

**Answer:** (Page 47)

100Base-T technology is backward compatible and allows the participants to negotiate a speed when connection is established. This process is known as auto negotiation.

**We want to add some extra options in IP datagram header. What is the right place of adding extra option in header?**

**Answer:** (Page 111)

- Additional information is stored in optional extension headers, followed by data.
- Flow label and quality of service allows audio and video applications to establish appropriate connections.
- New features can be added more easily. So it is extensible.

**Which technique is used to perform insertion and deletion in routing table?**

**Answer:** [click here for details](#)

### **Hashing**

The idea behind hashing is to compress a long search string to a shorter one, for example, a 32-bit IP destination address may be compressed to an 8- to 10-bit string, thus making the table small enough to search very fast. There must be some kind of software process running in the background that performs the compression, insertion, and removal of the entries of the table. The obvious problem is that the number of the entries that the table can accommodate is rather small. Also, once this number exceeds a certain point, the hashing has to go to its second and third choices, which degrade the performance.

Accurately implemented hashing can give excellent results in most of the cases; however, none of the hashing algorithms can guarantee such performance in the worst case.

Frequent insertion and removal of entries with hashing can result in recalculating of the hashing function that degrades the total performance of the algorithm.

### **Direct memory lookups (DIRECT INDEXING)**

Algorithms based on the direct memory lookups are fast and can guarantee the worst case. Today memory is relatively cheap, and with some intelligent hierarchy, very high speeds can be archived with moderate memory requirements. However, these algorithms are only a temporary solution, because direct lookup will not be feasible for IPv6 addresses. Insertion and removal can be very expensive, especially in the case of a short prefix. Such operation may require thousands of memory cycles.



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**Network administrator wants to send packet to other network .Does IP datagram contain the next Hop address if yes, then how does it forward packet to the next HOP.**

**Answer: (Page 103)**

Destination address in IP datagram is always ultimate destination. Router looks up next-hop address and forwards datagram. Network interface layer takes two parameters:

- IP datagram
- Next-hop address

Next-hop address never appears in IP datagram.

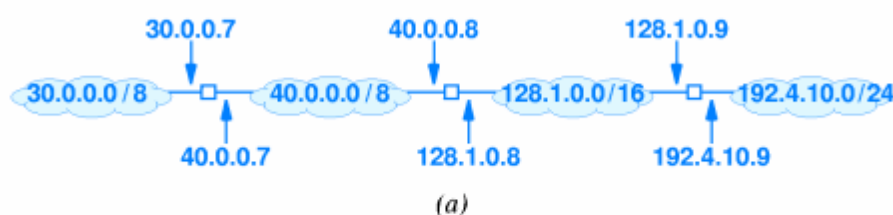
**Destination, mask and next hop table which is on page no 103 (at the mid)**

**Answer: (Page 103)**

**ROUTING TABLES AND ADDRESS MASKS:**

In practice, additional information is kept in routing table. Destination is stored as network address. Next hop is stored as IP address of router. Address mask defines how many bits of address are in prefix. Prefix defines how much of address used to identify network.

For example, class A mask is 255.0.0.0 which is used for subnetting. A routing table with address masks is shown in the figure below:



Destination	Mask	Next Hop
30.0.0.0	255.0.0.0	40.0.0.7
40.0.0.0	255.0.0.0	deliver direct
128.1.0.0	255.255.0.0	deliver direct
192.4.10.0	255.255.255.0	128.1.0.9

(b)

**Why we call vertical error the vertical error?**

**Answer: (Page )**

Vertical error is called the vertical error because this type of error occurs due to a hardware failure. e.g. the second bit of every character will damage.



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**How computer transmit data on token ring network? 3 marks.**

**Answer:** (Page 30)

**TOKEN RING:**

Many LAN technologies that are ring topology use token passing for synchronized access to the ring. The ring itself is treated as a single shared communication medium. Both pass from transmitter passed by other computers and are copied by destination. Hardware must be designed to pass token even if attached computer powered down.

**USING THE TOKEN:**

When a computer waits to transmit it waits a token. After transmission computer transmits token on ring. Next computer is then ready to transmit, receive and then transmits.

**TOKEN AND SYNCHRONIZATION:**

Because there is only one token, only one computer will transmit at a time. Token is a short reserved frame that can not appear in data. Hardware must regenerate token if lost. Token gives computer permission to send one frame. If all computers are ready to transmit it enforces Round-Robin access. But if now computer is ready to transmit, token circulates around ring.

**Write down complete names of multicast routing protocols. 5 marks.**

**Answer:** (Page 142,145)

Internet Group Multicast Protocol (IGMP)

DISTANCE VECTOR MULTICAST ROUTING PROTOCOL (DVMRP)

PROTOCOL INDEPENDENT MULTICAST \_ SPARSE MODE (PIM-SM)

PROTOCOL INDEPENDENT MULTICAST \_ DENSE MODE (PIM-DM)

MULTICAST EXTENSIONS TO THE OPEN SHORTEST PATH FIRST PROTOCOL (MOSPF)

**During transmission of the data from source to destination in a network of 50 computers, some packets contain errors. In this situation, which field of IP datagram header will indicate about errors..?**

**Answer:** [click here for details](#)

HEADER CHECKSUM field of IP data gram header will indicate about errors.

**Which types of protocols are used to exchange internal and external routing information in autonomous groups? Just write the names.**





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[Answer: \(Page 135\)](#)

INTERIOR GATEWAY PROTOCOLS (IGPs):

It is used among routers within autonomous system. The destinations lie within IGP.

EXTERIOR GATEWAY PROTOCOLS (EGPs):

It is used among autonomous systems. The destinations lie throughout Internet

**When you have a large network then why sequential approach is not suitable for address resolution?**

[Answer: \(Page 94\)](#)

For large networks the sequential approach uses too much CPU time.

**Which protocol is capable of buffering the outgoing and incoming data in both directions?**

[Answer: click here for details](#)

TCP can buffer outgoing and incoming data in both directions(Full Duplex Communication)

**TCP/IP support different of address resolution algorithm in a real environment. Write their names.**

[Answer: \(Page 94\)](#)

Address resolution algorithms can be grouped into three basic categories:

- Table lookup
- Closed-form computation
- Message Exchange

**Suppose an Organization has multiple local area computer networks that are connected with each other's through routers and RIP is used to manage routing information. You are required to write three main drawbacks of using RIP.**

[Answer: click here for details](#)

- The hop count cannot exceed 15, otherwise it will be considered invalid.
- Most RIP networks are flat. There is no concept of areas or boundaries in RIP networks.
- Variable Length Subnet Masks are not supported by RIP version 1.
- RIP has slow convergence and count to infinity problems.



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TCP's widely used because TCP connections deliver the data from one end to other end in real .so why TCP connections are called virtual connections? Give at least three reasons.

**Answer:-** [click here for details](#)

TCP is known as a connection-oriented protocol, which means that a connection is established and maintained until such time as the message or messages to be exchanged by the application programs at each end have been exchanged. So TCP connections are called Virtual Connections. They are created by software only. Internet does not provide software or hardware support for the connections. TCP software modules on two computers create an illusion of a connection.

**Suppose a security agency has adopted TCP in its computer network for more reliability. Which process is used by TCP to establish reliable connection? Explain the process by giving all steps involved in this process.**

**Answer:** [click here for details](#)

To establish a reliable connection, **TCP uses a three-way handshake**. Before a client attempts to connect with a server, the server must first bind to and listen at a port to open it up for connections: this is called a passive open. Once the passive open is established, a client may initiate an active open. To establish a connection, the three-way (or 3-step) handshake occurs:

1. **SYN:** The active open is performed by the client sending a SYN to the server. The client sets the segment's sequence number to a random value A.
2. **SYN-ACK:** In response, the server replies with a SYN-ACK. The acknowledgment number is set to one more than the received sequence number i.e. A+1, and the sequence number that the server chooses for the packet is another random number, B.
3. **ACK:** Finally, the client sends an ACK back to the server. The sequence number is set to the received acknowledgement value i.e. A+1, and the acknowledgement number is set to one more than the received sequence number i.e. B+1.

At this point, both the client and server have received an acknowledgment of the connection. The steps 1, 2 establish the connection parameter (sequence number) for one direction and it is acknowledged. The steps 2, 3 establish the connection parameter (sequence number) for the other direction and it is acknowledged. With these, a full-duplex communication is established.

**What is the method of implementation to improve the computational efficiency using in the lookup table.....5 marks?**

**Answer:** (Page 95)

There are two standard implementations to improve computational efficiency:

- Hashing
- Direct indexing



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### HASHING:

Hashing is the transformation of a string of characters into a usually shorter fixed-length value or a key that represents the original string. Hashing is used to index and retrieve items in a database because it is faster to find the item using the shorter hashed key than to find it using the original value. It is also used in many encryption algorithms.

### DIRECT INDEXING:

It is less generally known technique. It is possible only in cases where protocols address are assigned from a compact range.

**TCP/IP is responsible which type of protocols for reliable transmission.**

**Answer:**

The **Transmission Control Protocol (TCP)** is one of the core protocols of the Internet protocol suite (IP), and is so common that the entire suite is often called *TCP/IP*. TCP provides reliable, ordered and error-checked delivery of a stream of octets between programs running on computers connected to a local area network, intranet or the public Internet. It resides at the transport layer.

**Is there a comparison between TCP/IP reference model and OSI reference model?**

**Answer:** [click here for details](#)

Both the TCP/IP and OSI are international standards for data communication. Both use the concept of protocol layering. These are the conceptual tools that is often used to show how various protocols and technologies fit together to implement networks. The functions that the model represents are much the same. This means that the TCP/IP and the OSI models are really quite similar in nature even if they don't carve up the network functionality pie in precisely the same way. There is a fairly natural correspondence between the TCP/IP and OSI layers; it just isn't always a “one-to-one” relationship. Since the OSI model is used so widely, it is common to explain the TCP/IP architecture both in terms of the TCP/IP layers and the corresponding OSI layers.

**How can a datagram be transmitted across a physical network that does not understand the datagram format?**

**Answer:** [click here for details](#)

Encapsulate!

The network interface layer encapsulates an entire datagram in the data area of a hardware frame. The network hardware ignores the datagram format.



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The hardware treats a frame containing a datagram like any other frame.  
The sender places a frame type in the frame header indicating that the frame contains a datagram.  
The receiver reads the frame type and knows the frame contains a datagram.

**Describe the difference between static and dynamic routing?**

[Answer: \(Page 133\)](#)

**STATIC ROUTING:**

It is one of the forms of Internet routing. In Static routing, the table is initialized  
When system boots and there is no further changes.

**DYNAMIC ROUTING:**

In dynamic routing the table is initialized when system boots. It includes routing Software which  
learns routes and updates table. In this way continuous changes are possible due to routing software.

**What is IPv6 ADDRESS NOTATION?**

[Answer: \(Page 114\)](#)

**IPv6 ADDRESS NOTATION:**

128-bit addresses unwisely in dotted decimal; requires 16 numbers:

105.220.136.100.255.255.255.0.0.18.128.140.10.255.255

Groups of 16-bit numbers in hex separated by colons – colon hexadecimal (or colon hex).

69DC: 8864:FFFF: FFFF: 0:1280:8C0A:FFFF

Zero-compression – series of zeroes indicated by two colons

FF0C: 0:0:0:0:0:0:B1

FF0C::B1

IPv6 address with 96 leading zeros is interpreted to hold an IPv4 address.

**Unicast routing and multicast routing P# 114)**

[Answer: \(Page 142,114\)](#)

**MULTICAST ROUTING:**

Internet multicast routing is difficult because internet multicast allows arbitrary computer  
to join multicast group at any time. It allows arbitrary member to leave multicast group at  
any time. It also allows arbitrary computer to send message to a group (even if not a  
member)



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**Unicast:**

It is used for single destination computer.

Multicast: It is used for multiple destinations; possibly not at same site.

**What is the difference between the physical and logical topologies?**

[Answer: \(Page 46\)](#)

**PHYSICAL TOPOLOGY:**

The way that the workstations are connected to the network through the actual cables that transmit data -- the physical structure of the network -- is called the physical topology. It depends on the wiring scheme.

**LOGICAL TOPOLOGY:**

The logical topology, in contrast, is the way that the signals act on the network media, or the way that the data passes through the network from one device to the next without regard to the physical interconnection of the devices. We can say that it is defined by the specific network technology.

**Is TCP an end to end protocol? Explain with the help of proper reason**

**Why TCP called end to end Protocol..... (2)**

[Answer: \(Page 120\)](#)

TCP established connection between nodes before transmission or receiving the data and It provides application-to-application communication, due to this feature, it is called end-to-end protocol.



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For a single administrator territory to have its autonomy there is always a gateway and territories regularly exchange useful information with neighboring territories In this case which Gateway Protocol will you suggest? Write at least four characteristics of protocol suggested in this situation

Answer: (Page )

An organization want to share the transmission of multiple devices of its network with single publicity router IP address . To achieve this goal it uses NAT. You are required to enlist the alternatives of NAT. [3 marks]

Answer: (Page )

Why class A, B and C are called primary classes (marks 2) Importance of intelligent network

Answer: (Page )

What will be the shortest possible path for secure communication?

Answer: (Page )

Network engineer wants to send some confidential data to a crime branch. How does he perform his task by using IPv6.support your answer?

Answer: (Page )

You are working in a Star organization as a network engineer. The existing network comprises \_\_\_\_\_ of \_\_\_\_\_ 120 systems. What will be your analysis about delay should it should be smaller or higher? \_\_\_\_\_ Give \_\_\_\_\_ reasons.

(3 Marks)

Answer: (Page )