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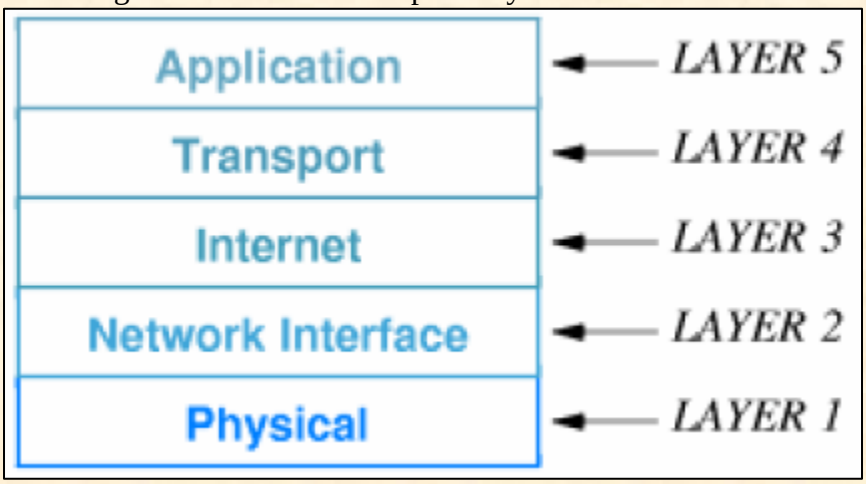
1) Write Protocol types for TCP/IP & its layers. & TCP/IP refer to group of data communication protocol, you are required to write the name of transport protocol that work in TCP/IP based. & Write the name of internet protocol suit & its layers name too

TCP/IP contains two transport protocols:
1) 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.
2) 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.
TCP/IP protocols are organized into five conceptual layers.



2) Write Address Classes types

Class	Range of Values
A	0 through 127
B	128 through 191
C	192 through 223
D	224 through 239
E	240 through 255

3) Write Address Resolution techniques

ADDRESS RESOLUTION TECHNIQUES:
Address resolution algorithms can be grouped into three basic categories:
• Table lookup • Closed-form computation • Message Exchange

4) Write 5 Multicast address protocol types.

Multicast protocols:
Several multicast protocols exist. Some of the proposed protocols are:

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1) Distance Vector Multicast Routing Protocol (DVMRP):
2) Core Based Trees (CBT):
3) Protocol Independent Multicast_ Sparse Mode (PIM-SM):
4) Protocol Independent Multicast _ Dense Mode (PIM-DM):
5) Multicast Extensions to the Open Shortest Path First Protocol (MOSPF):

5) 2 alg alg autonomous given thy, un mei just identify krna tha k kahn py EGP protocol use ho ga or kahn py IGP 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

6) End to end and computer to computer communication.

TRANSPORT PROTOCOLS:
• Provide application-to-application communication.
• Need extended addressing mechanisms to identify applications.
• Are called end-to-end communication.
The end-to-end principle is a design framework in computer networking. In networks designed according to this principle, guaranteeing certain application-specific features, such as reliability and security, requires that they reside in the communicating end nodes of the network.
Or 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.

7) What is Static & Dynamic Routing? Or TWO FORMS OF INTERNET ROUTING:

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.

8) Address resolution algorithm use krny thy, table lookup, Data exchange or closed form. Table mei data given tha bs aagy mention krna tha k ye kis algorithm se match krta ha

1. TABLE LOOKUP: In Table Lookup, binding or mapping is stored in a table in memory, which the software searches when it needs to resolve an address.
2. CLOSED-FORM COMPUTATION: In Closed-form computation, the protocol address assigned to a computer is chosen carefully so that computer's hardware address can be computed from the protocol address using basic Boolean and arithmetic operations.
3. MESSAGE EXCHANGE: In Message Exchange, Computers exchange messages across a network to resolve an address. One computer sends a message that requests an address binding (translation) and another computer sends a reply that contains the requested information.

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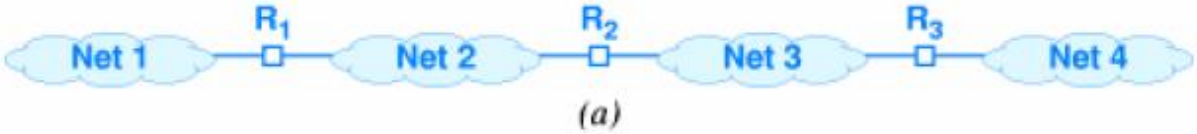
9) Value was given define class cidr notation.

CIDR NOTATION: Inside a computer, each address mask is stored as a 32-bit value. When we enter a prefix and an address mask they use a modified form of dotted decimal addressing called CIDR addressing, which is known as CIDR Notation.

As an example how CIDR adds flexibility, suppose a single class B prefix (e.g. 128.211.0.0) i.e. 216 host addresses 16-bit CIDR mask denoted as: 128.211.0.0/16

10) Routing ki next hope likhni thi

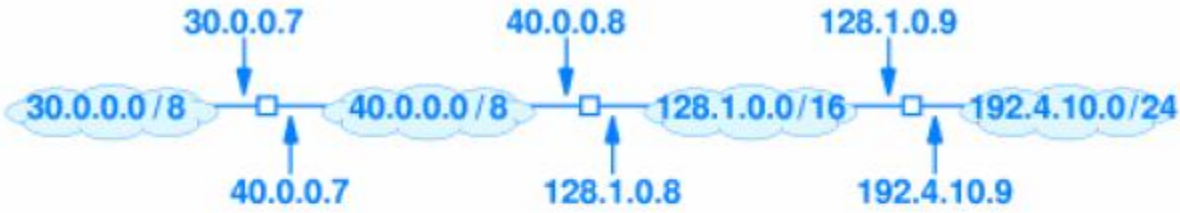
Idea Solution 1:



(a)

Destination	Next Hop
net 1	R_1
net 2	deliver direct
net 3	deliver direct
net 4	R_3

Idea Solution 2:



(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

11) What is Sub-netting?

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A subnet, or subnetwork, is a segmented piece of a larger network. More specifically, subnets are a logical partition of an IP network into multiple, smaller network segments. The Internet Protocol (IP) is the method for sending data from one computer to another over the internet.

12) What is RIP & OSPF?

1) ROUTING INFORMATION PROTOCOL (RIP): "It is used for routing within an autonomous system (IGP). "It uses UDP for all message transmissions. "RIP is used over LAN. Version 1 of RIP uses hardware broadcast and version 2 allows delivery via multicast. "It uses distance vector algorithm. "RIP allows hosts to listen passively and update its routing table

2) THE OPEN SHORTEST PATH FIRST PROTOCOL (OSPF): As the internet grew in size, so did organizations. In particular, large ISPs appeared. To satisfy demand for a routing protocol that can scale to large organizations, the IETF devised an IGP known as the Open Shortest Path First Protocol (OSPF).

13) WHAT IS MU Write the name of MTU split technique

MTU:

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

FRAGMENTATION: 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.

14) 2 column given thy, 2no side py data likha tha. Unko match kr k unko sai jga py likhna tha, column OSPF k bary mei tha

Idea Solution:

THE CHARACTERISTICS OF OSPF:

"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).

"LINK-STATE ALGORITHM: OSPF uses link-state routing.

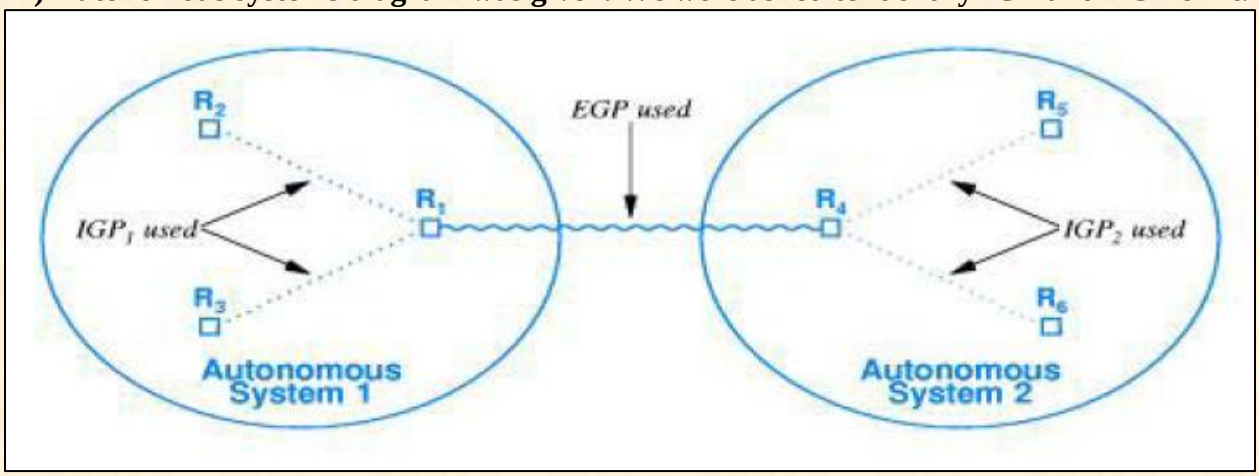
"SUPPORT FOR MULTI-ACCESS NETWORKS: Traditional link state routing is inefficient across a multi-access network, such as an Ethernet, because all routers attached to the network broadcast link status. OSPF optimizes by designing a single router to broadcast on the network.

15) IP address 110.65.70.64/15**, find subnet mask, number of bits using for subneting, totoal useable address**

Idea Solution:
Suppose
D = Destination Address
(A, M)= (32-bit IP Address, 32-bit Address Mask)
A = = (D & M)
Now as an example consider a 32-bit mask:
11111111 11111111 00000000 00000000
Which can be denoted in dotted decimal as 255.255.0.0.
Consider a network prefix:
10000000 00001010 00000000 00000000
Which can be denoted in dotted decimal value as 128.10.0.0.
Consider a destination address: 128.10.2.3
That has Binary equivalent as:
10000000 00001010 00000010 00000011
A logical 'and' between D and M produces the binary result as:
10000000 00001010 00000000 00000000
Which is equal to prefix 128.10.0.0.

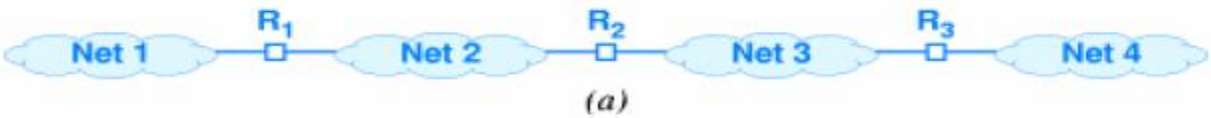
16) consider a larger scale computer network updates or change are made manually routing table. Write the name of that technique
Ans OSPF

17) Autonomous systems diagram was given. We were asked to identify IGP and EGP on it.



An Internet routing architecture is shown. Each autonomous system used to communicate among autonomous systems chooses an IGP to use

18) Routing diagram was given. We were to fill Routing table for R2 router. (5)



(a)

Destination	Next Hop
net 1	R_1
net 2	deliver direct
net 3	deliver direct
net 4	R_3

19) Name of the Connection-Oriented Service. (3)
ANS. TCP

20) Name of the Connection-Less Service. (3)
ANS. UDP

21) What is nat names of the alternatives of nat. (3)

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. VPC Endpoints are a free alternative to NAT Gateway, but can only talk to S3 or DynamoDB.

22) 5 types of messages were given you have to find 3 informational messages

INFORMATIONAL MESSAGES:
These are as follows:
• Echo request/reply • Address mask request /reply • Router discovery

Q1: Write Down step of assign IP Address
The first step is to assign IP addresses in which usually class C addresses are assigned. Network administrator computes the ultimate size of each physical network and assigns a prefix.

Q2: write down Range of IP Class A, B, C
Class Range of Values
A = 0 through 127, B = 128 through 191, C = 192 through 223, D = 224 through 239, E = 240 throug 255

Q3: properties given thi or ye btana tha k IPv4 ki ha ya IPv6 ki.

Q4: Bridge, Gateway, Routers, Hub. Ink agy randomly inki detail thi.. Wo arrange kr k likhni thi jski bhi thi usk agy.

TYPE OF RESOLUTION ARP TECHNIQUES: 1) Useful with any hardware = T, 2) Address change affects all hosts = T, 3) Protocol address independent of hardware address T, D, 4) Hardware address must be smaller than protocol address C, 5) Protocol address determined by hardware address C, 6)

Requires hardware broadcast D, 7) Adds traffic to a network D, 8) Produces resolution with minimum delay T, C 9) Implementation is more difficult D

4, diagram thi usk according Next Hope btana tha kn kn sy hai.
Next Hop1) net 1 = R1, 2) net 2 = deliver direct, 3) net 3 = deliver direct, 4) net 4 = R3
Next Hop D = 30.0.0.0, M = 255.0.0.0 N.H = 40.0.0.7 2) D = 40.0.0.0, M = 255.0.0.0, N.H = deliver direct, 3) D = 128.1.0.0, M = 255.255.0.0, N.H = deliver direct, 4) D = 192.4.10.0 M = 255.255.255.0 N.H = 128.1.0.9 S

6) border gateway protocol

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.

1) type of router
There are five main types of routers in the market according to the application category. They are wired routers, wireless routers, core routers, edge routers

IPv6 ka aik q tha
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.

when data transmission rate is higher reliability suffers Which protocol will you choose.
TCP provides reliable stream delivery of data between Internet hosts

Name of multicast protocol use within organization.

PROTOCOL INDEPENDENT MULTICAST _ *DENSE MODE (PIM-DM):&* MULTICAST EXTENSIONS TO THE OPEN SHORTEST PATH FIRST PROTOCOL (MOSPF):

IPV6 HEADER
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.

Mechanism use by tcp to control data flow
One of the popular flow control mechanisms in TCP is the **sliding window protocol**. It's a byte-oriented process of variable size. In this method, when we establish a connection between the sender and the receiver, the receiver sends the receiver window to the sender.

Tcp/ip ki layers kaha pe kaunsi use hoti

LAYER 1:
Corresponds to basic network hardware layer in OSI.

LAYER 2:
Specifies how to organize data in frames.

LAYER 3:
Specifies the format of packets sent across an Internet and forwards packets.

LAYER 4:
Specifies how to ensure reliable transfer.

LAYER 5:
Like 6 and 7 in OSI model, it specifies how one application uses an Internet.

• Name of the Routing metric used by RIP. (3)
RIP uses HOP COUNT METRIC to measure the distance to a destination.

•Why there is the need of Autonomous Systems in Internet?
An autonomous system can be thought of as a set of networks and routers under one administrative right. The term is flexible. It can be an entire intuition or a single corporation. It is needed for the reason that no routing protocol can scale to entire Internet.

•Suppose first four bits as 1111 of an IP address then to which class this IP address belongs?

Class A = 0, Class B = 10, Class C = 110, Class D =1110, Class E = 1111

•IS TCP/IP suit including ARP. What kind of messages are in ARP.
The TCP/IP protocol suite includes an Address Resolution Protocol (ARP).
The ARP standard defines two basic message types:
• Request
• Response

bki conceptual thy questions sae s yd ni mjhy.. ek configuration type tha question k kb same Hoti or kb insert krny k bd chnge Hoti...

CONFIGURATION-AND-TUNNELING:
Configuration-and-tunneling is ideal in a situation where the group is geographically dispersed (i-e., has a few members at each site, with sites separated by long distances).

TWICE NAT:

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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.

Question: Consider the IP address: 178.200.127.5 and the corresponding subnet mask 255.255.255.0, find out the followings:
a. The number of bits used for sub netting
b. Total number of useable hosts in the subnet
c. Write the CIDR notation for the above scenario
Answer:
a. The number of bits used for sub netting
8 bits
b. Total number of host in the subnet
254
c. The network address of the subnet.
178.200.127.0

FRAGMENTATION AND PATH MTU:

IPv6 source (not intermediate routers) is responsible for fragmentation. Routers simply drop datagrams larger than network MTU (Maximum Transmission Unit). So source must fragment datagram to reach destination.
Source determines path MTU. The smallest MTU on any network between source and destination and it fragments datagram to fit within that MTU.

42: 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:
BUFFER, FLOW CONTROL AND WINDOWS:
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.

What is the first address in the block if one of the address is 140.120.8424/20?
The first address is 140.120.80.0/20

130.4.102.1/22 write the subnet mask for that
255.255.252.0

Find the number of useable host addresses in the block if one of the subnet address is 140.120.84.24/20.
Usable Host Range:140.120.80.1 - 140.120.95.254
Broadcast Address:140.120.95.255
Binary Netmask:11111111.11111111.11110000.00000000
Total number of hosts:4,096
Number of usable hosts:4,094
IP Class:B
CIDR Notation:/20
Netmask:255.255.240.0

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Tell the first assignable IP address from a 128.140.80.24/20. (2 Marks)
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.
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 sub netting
b. Total number of host in the subnet
c. The network address of the subnet
d. The subnet address of the IP address.
The number of bits used for sub netting 8 bits
Total number of host in the subnet 254
The network address of the subnet. 178.200.127.0

43: Identify IPv4 datagram header fields from the following.
• Source IP Address
• Sequence Number
• Acknowledgement Number
• Time to live
Answer:
Acknowledgement Number
Sequence Number

48: How IP multicast group becomes anonymous? Describe any two ways.
Answer:
IP MULTICAST SEMANTICS:
It group is unidentified in two ways:
1. Neither a sender nor a receiver knows the identity or the number of group members.
2. Routers and hosts didn't knows which applications will send a datagram to a group

Question: Suppose Electronic Company wants to build a network of 245 hosts. Network Supervisor is given a task for assigning IP addresses to 245 hosts. Which class of IP address will be best suitable for this scenario? Support your answer with reason.
Answer: Class C
Reason: it has 8 octet for suffix and maximum 256 host for one network.

Address Class	Bits In Prefix	Maximum Number of Networks	Bits In Suffix	Maximum Number Of Hosts Per Network
A	7	128	24	16777216
B	14	16384	16	65536
C	21	2097152	8	256

CS610 Current Paper Fall 2022

Q1-Which variant of NAT fails when an application uses the IP address instead of domain name?

Answer:

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Twin NAT fails when an application uses the IP address instead of domain name.

Q2- An Internet may have networks with different MTUs. Suppose router detects datagram larger than network MTU and then it splits into pieces. After splitting the datagram each piece becomes smaller than outbound network MTU. You are required to write the name of the technique that will be used to spilt datagram into pieces.

Answer: Fragmenting Technique is use to splitting datagram into pieces according to network MTU.

Q3- Suppose that there are two users "X" and **"**Y" that exchange data between each other. Both have the option to select either connectionless services or connection-oriented services. You are required to mention the protocol name which is used in case if **"**X" opts connection-oriented services

Answer: If user **"**X" **chooses connection-oriented services** which is **TCP** then user "Y" should also go with connection-oriented services.

Q4- Match Column 'A' with Column 'B'

Column 'A'	**Column 'B'**
Networks and routers can be illustrated using OSPF	Protocol.
OSPF is **a**	Algorithm.
Link State	graph.

Solution:

Column 'A'	**Column 'B'**
Networks and routers can be illustrated using OSPF	Graph.
OSPF is **a**	Protocol.
Link State	Algorithm.

Q5- Which TCP/IP layer is used for internetworking? Write the layer name. Also mention the type of address which is used on this layer.

Answer: TPC layer and it has Physical Layer, Address mask defines how many bits of address are in Prefix and Suffix contains datagram.

Q6- 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:

- Distance Vector Routing Protocol
- Core Tree Routing Protocol
- Open shortest path first (OSPF)
- PIM-BM

Q7- In an organization where a large network is deployed and some remote locations are connected to it. Write the name of the protocol that can be used for network troubleshooting. Also identify any two tools which use this protocol.

Answer:

Internet Protocol: Provides computer-to-computer communication also, called machine-to-machine communication. (e.g) IPng, IPv4, IPv6

Transport Protocol: Provides application-to-application communication, also called end-to-end communication. In TCP when a computer sends a segment, the source address and sequence number fields refer to incoming data.TCP message is encapsulated in an IP datagram and sent across the Internet. Reliability is the responsibility of the transport layer. RIP protocol(s) provide the routing information at the autonomous system level.

Further Types:

- Routing Information Protocol
- Address Resolution Protocol

Q8- Suppose an ISP has an IP address 110.65.70.64/15. You have to find the following:

a. The number of bits used for subnetting
b. Number of usable hosts
c. Subnet mask

Answer:

Q9- Following table contains features of different address resolution algorithm. You are required to fill the empty column of following table by writing appropriate address resolution algorithm from the following

- Table lookup

- Closed form Computation
- Data Exchange.

Solution:

Features	Type of resolution
Require hardware broadcast	Data Exchange
Adds traffic to a network	Table lookup
Protocol address determined by hardware address	Closed form Computation
Useful with any hardware	Table lookup
Implementation is more difficult	Closed form Computation

Q10- Answer the followings concerning IP Routing:

a) In which type of routing, the route remains the same after configuration?

b) In which type of routing, the route will be inserted manual but changes after configuration?

Answer: In **Static Routing** type the route remains the same after configuration.

Answer: In **Default Routing** type the route inserted manual but changes after configuration.