CMR INSTITUTE OF TECHNOLOGY

Internal Assessment Test 2 – 2nd NOV. 2016

Sub:	**Computer Communication Networks**					**Code:**	10EC/TE71
Date:	02/11/2016	Duration: 90 mins	Max Marks: 50	**Sem:**	VII	**Branch:**	ECE/TCE

Note: Answer any 5 full questions.

1. (a). The ISP wants a) An organization is given the block 17.12.40.0/26, which contains 64 addresses. The organization has three offices and needs to divide the addresses into three sub blocks of 32, 16, and 16 addresses. Draw a neat subnetted diagram.

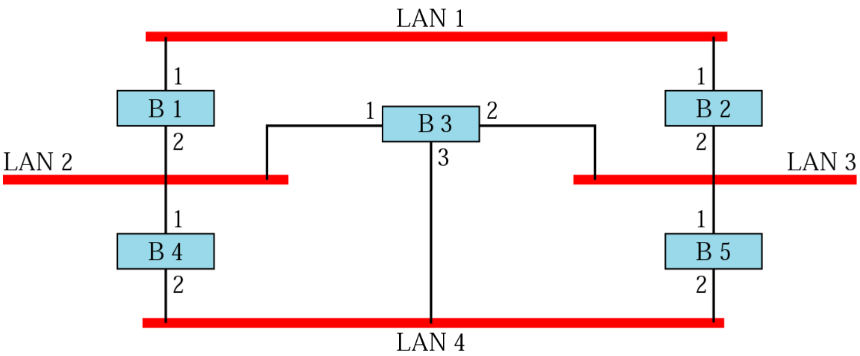
   (b). find the class of the following IP address
   1) 237.14.2.1 2) 208.25.54.12 3) 129.14.6.8 4) 114.34.2.9 [8+2]

2. (a) With a neat diagram explain IPv4 header format.

   (b) Explain any two techniques for transition from IPV4 to IPV6. [6+4]

3. (a) Describe briefly about Bridge and Router.

   b) A system with four LANs and five bridges is shown in above figure. Choose B1 as the root bridge. Show the forwarding and blocking ports, after applying the spanning tree procedure



[3+7]

OR

. (a). A pure ALOHA network transmits 200-bit frames on a shared channel of 200 kbps. What is the throughput if the system produces

a) 1000 frames per second

b) 500 frames per second

c) 250 frames per second.

(b) Explain CSMA with collision avoidance with necessary diagrams [5+5]

4. (a) Draw and list different connecting devices on the basis of layers they operate.

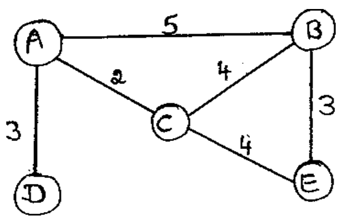
(b) With a neat diagram Explain Virtual LAN briefly [6+4]

5. Briefly discuss the following forwarding techniques

(a). 1) Next-Hop versus Route method 2) network specific method versus Host specific method and default method . [6]

(b). Distinguish between multicasting and multiple unicasting [4]

6. Explain Distance vector algorithm for given network. [10]



7. (a) Explain different fields in typing routing table? What are significance of flags field.

(b) Expand the following IPV6 address

1) 0::0
2) 0:ABC::00

(c) Find the subnet address for the following

IP address	Mask
125.54.12.56	255.255.0.0
141.181.80.16	255.255.224.0

(6+2+2)

INTERNAL ASSESSMENT TEST - II
COMPUTER COMMUNICATION NETWORKS.

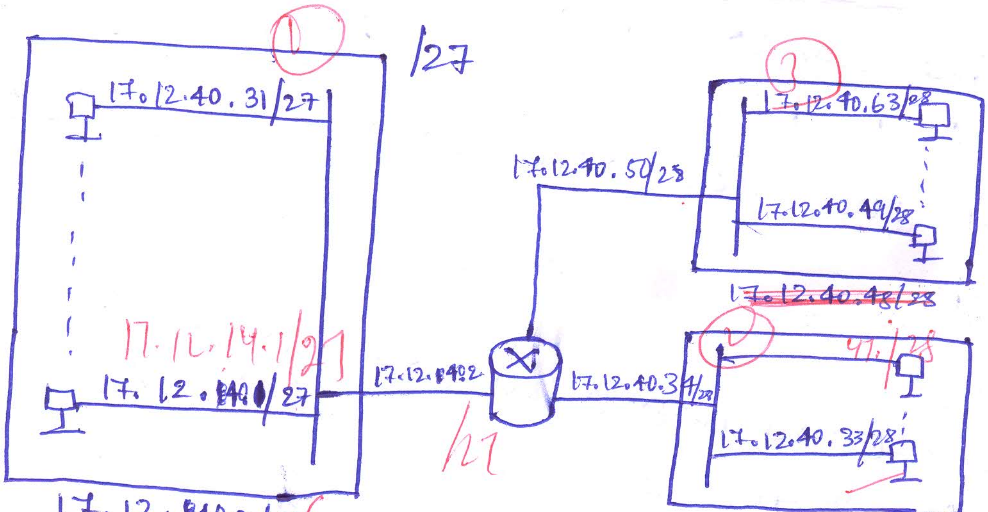
Q1 a) ~~The ISP wants~~ a) An organization is given the block 17.12.40.0/26, which contains 64 addresses. The organization has three offices and needs to divide the addresses into three sub blocks of 32, 16 and 16 addresses. Draw and illustrate a neat subnetted diagram.

Solution:

Organization address: 17.12.40.0.

Total number of address assigned to organization = 64

64 → 32, 16, 16



6M

Mask:

Let the mask of 1st subnet is n_1,

Address Range $= 2^{32-n_1} = 32 = 2^5$

$5 = 32 - n_1 \Rightarrow \boxed{n_1 = 27}$

Mask of 2nd subnet is $n_2 \Rightarrow 2^{32-n_2} = 16 = 2^4 \Rightarrow \boxed{n_2 = 28}$ 3M

Mask of 3rd subnet is $n_3 \Rightarrow 2^{32-n_3}$

The 1st address can be found by taking (32−n) bits to zeros and last address by taking (32−n) bits to one.

Let us take random address from 1st subnet as 17.12.40.29.

Convert it into binary format.

0001 0001 0000 1100 0010 1000 0001 1101

$32-n_1 = 5$

(1) First address

0001 0001 0000 1100 0010 1000 0000 0000

⇒ 17.12.40.0 ✓

Last address

0001 0001 0000 1100 0010 1000 0001 1111

⇒ 17.12.40.31 ✓

Consider the random address for subnet 2 as 17.12.40.40.

0001 0001 0000 1100 0010 1000 0010 1000

$32-n_2 = 4$

(2) First address

0001 0001 0000 1100 0010 1000 0010 0000

⇒ 17.12.40.32 ✓

Last address

0001 0001 0000 1100 0010 1000 0010 1111

⇒ 17.12.40.47 ✓

Consider the random address for subnet 3 as

(3) 17.12.~~40~~ 40. 50

0001 0001 0000 1100 0010 1000 0011 0010

$32-n_3 = 4$

First address

0001 0001 0000 1100 0010 1000 0011 0000

⇒ 17. 12. 40. 48.

Last address

0001 0001 0000 1100 0010 1000 0011 1111

⇒ 17. 12. 40. 63.

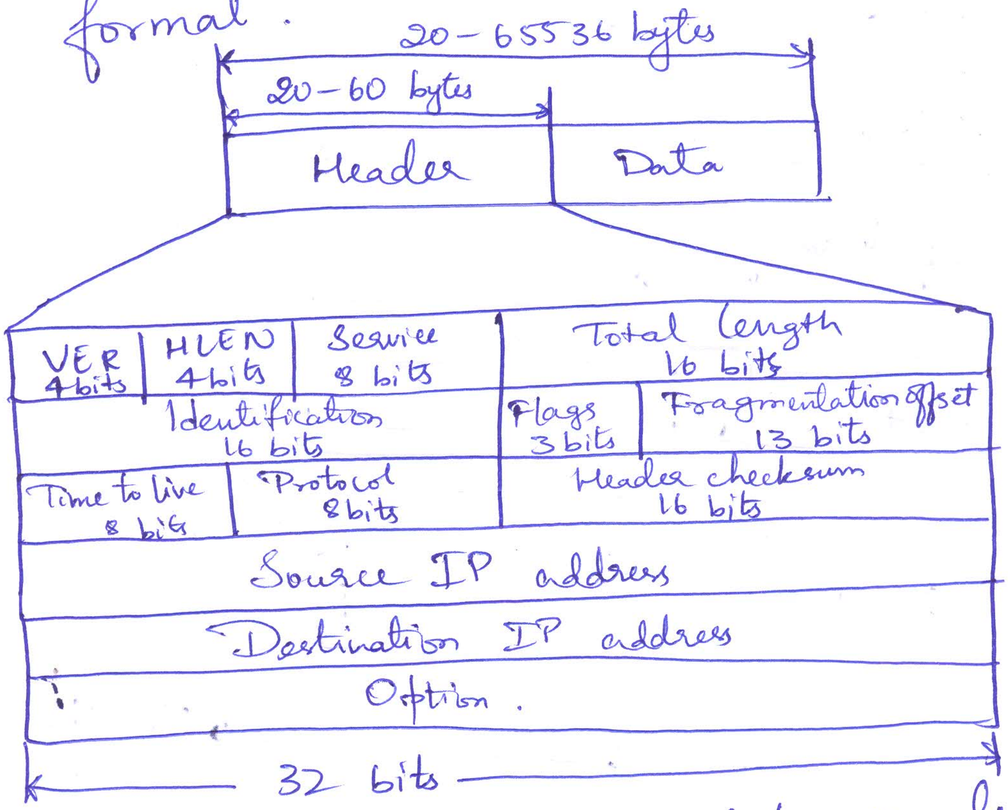
8

Q1b) Find the class of the following IP address

1) 237.14.2.1 – Class D
2) 208.25.54.12 – Class C
3) 129.14.6.8 – Class B
4) 114.34.2.9 – Class A

2

Q2a) With a neat diagram describe IPv4 header format.



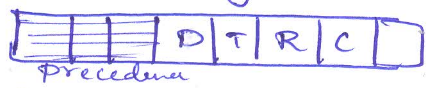
6

4m

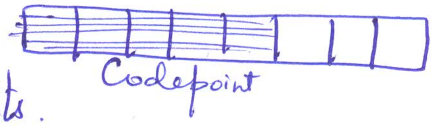
* Header is 20 to 60 bytes in length contains information essential to routing & delivery.
* VERsion is a 4-bit field. Version is 4

Header length (HLEN) : 4-bit field defines
total length of datagram header in 4-byte words.

Services : Service type :



Differential service :



The 1st 3 bits are precedence bits.
Next 4 bits are called type of service (TOS).

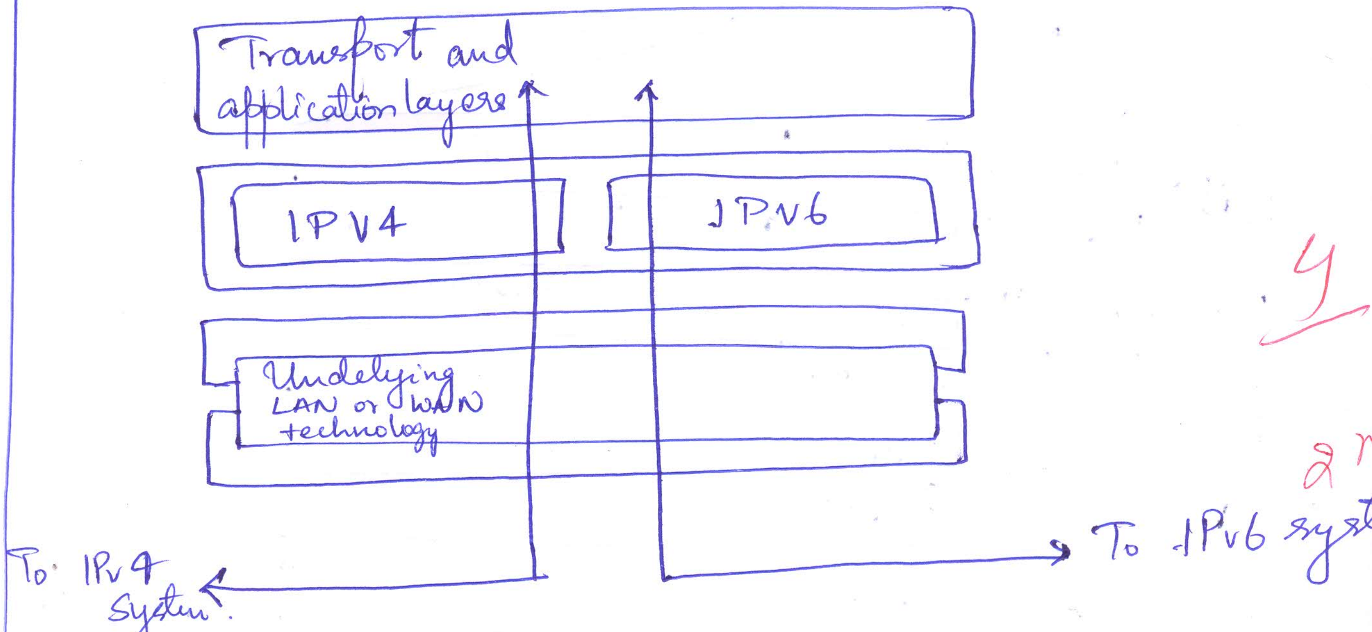
TOS bits	Definition
0000	Normal
0001	Minimize cost
0010	Max. reliability
0100	Max. throughput
1000	Min. delay

Category	Codepoint	Assigning Auth
1	XXXXX0	Internet
2	XXXX11	Local
3	XXXX01	Temp. or experi

Time to live : maximum time that the packet to
to travel through internet.
Checksum : The checksum values are updated with
transmitted message at receiver. If it is 0, it mea
the data is error free else the data is corrupte

Q2b) Explain any two techniques for transition
from IPv4 to IPv6.

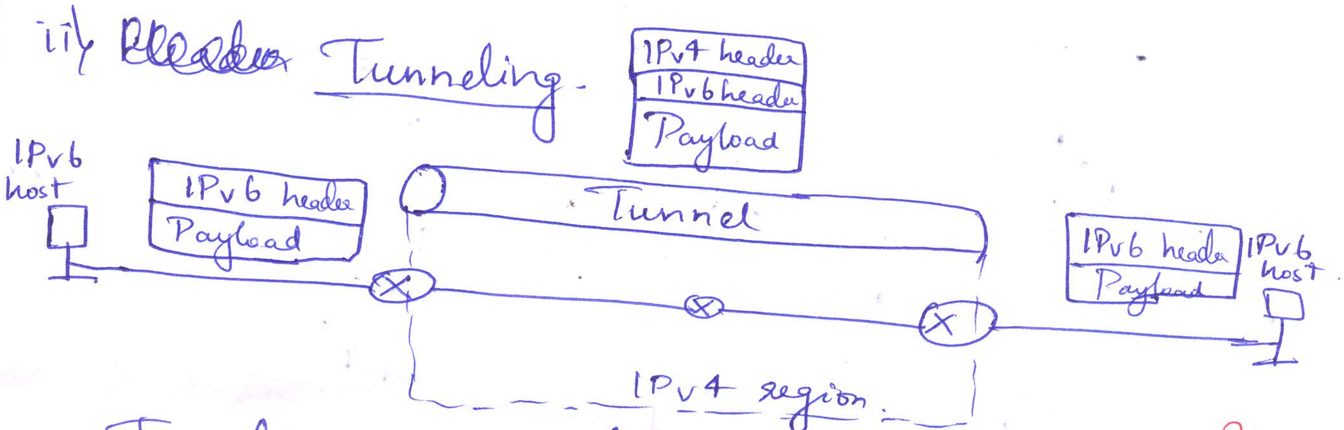
i) Dual Stack



It is recommended that all hosts, before
migrating completely to version 6, have a dual
stack of protocols. In other words, a station

must run IPv4 & IPv6 simultaneously until all the Internet uses IPv6.
To determine which version to use when sending a packet to a destination, the source host queries the DNS. If the DNS returns IPv4 address, the source host sends an IPv4 packet. If the DNS returns an IPv6 address, the source host sends an IPv6 packet.

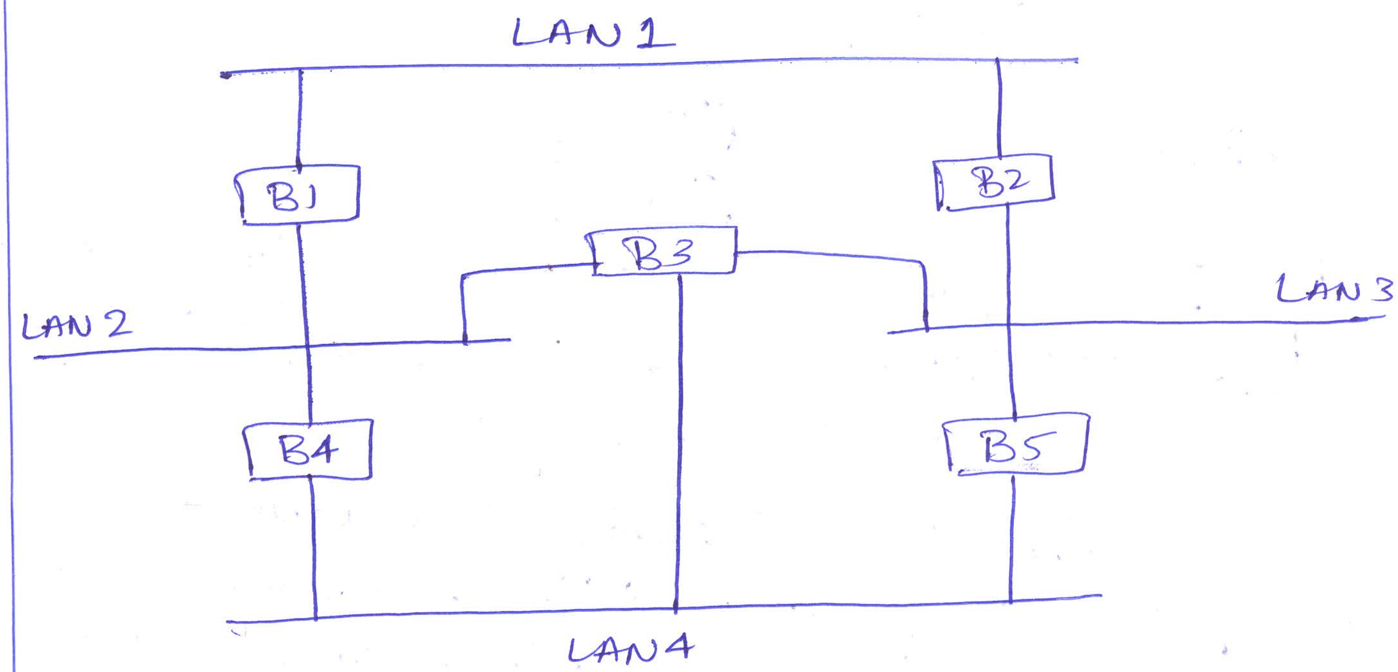
ii) ~~Header~~ Tunneling.



Tunneling is a strategy used when two computers using IPv6 want to communicate with each other and packet must pass through a region that uses IPv4. To pass through this region, the packet must have an IPv4 address. So the IPv6 packet is encapsulated in a IPv4 packet when it enters the region, and it leaves its it's capsule when it exits the region. It seems as if the IPv6 packet goes through a tunnel at one end and emerges at other end. To make it clear that the IPv4 packet is carrying an IPv6 packet as data, the protocol value is set to 41.

Q3) What is loop problem? Explain solution of the loop problem in bridge.

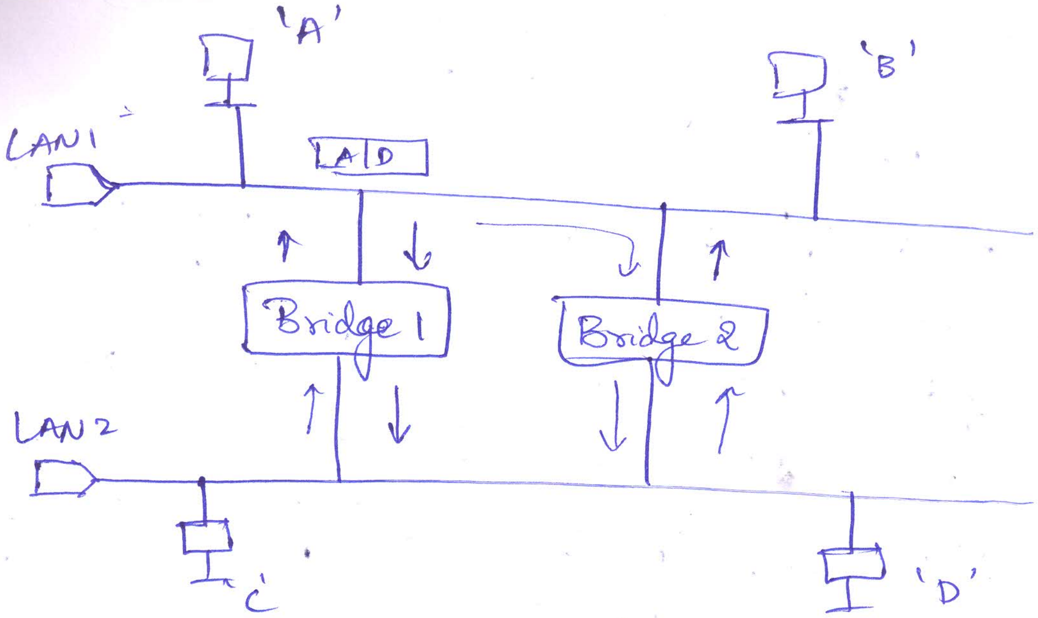
A system with four LANs and five bridges is shown in figure. Choose B1 as the root bridge. Show the forwarding and blocking ports, after applying the spanning tree procedure.



Solution:

Loop problem:

* Tranparent bridges work fine as long as there are no redundant bridges in the system
* However, system administrators like to have redundant bridges to make system more reliable.
* If a bridge fails, another bridge takes over until the failed one is repaired or replaced.
* Redundancy can create loops in the system, which is very unreliable.



1. St. A sends a frame to st. D. The table of both bridges are empty. Both forward the frame & update their tables.
2. Now there are two copies of frame in LAN2. The copy sent out by bridge 1 is received by bridge 2, which does not have any information about the destination address D.
3. Now there are two copies of frame on LAN1. Step 2 is repeated, and both copies flood the network.
4. The process continues on and on.

* To solve the loop problem, the IEEE specification require that bridges use the spanning tree algorithm to create a loopless topology.

* The process to find the spanning tree involves 4 steps.

1. Select root bridge: bridge which has the smallest built-in-ID.

2. Mark one port of each bridge as root port.
   - → Root port : port with least cost path from the bridge to the root bridge.
   - → If 2 ports have same cost choose one.
3. Choose a designated bridge for each LAN.
4. Mark the root port and designated port as forwarding port, other are blocking.

(2M)

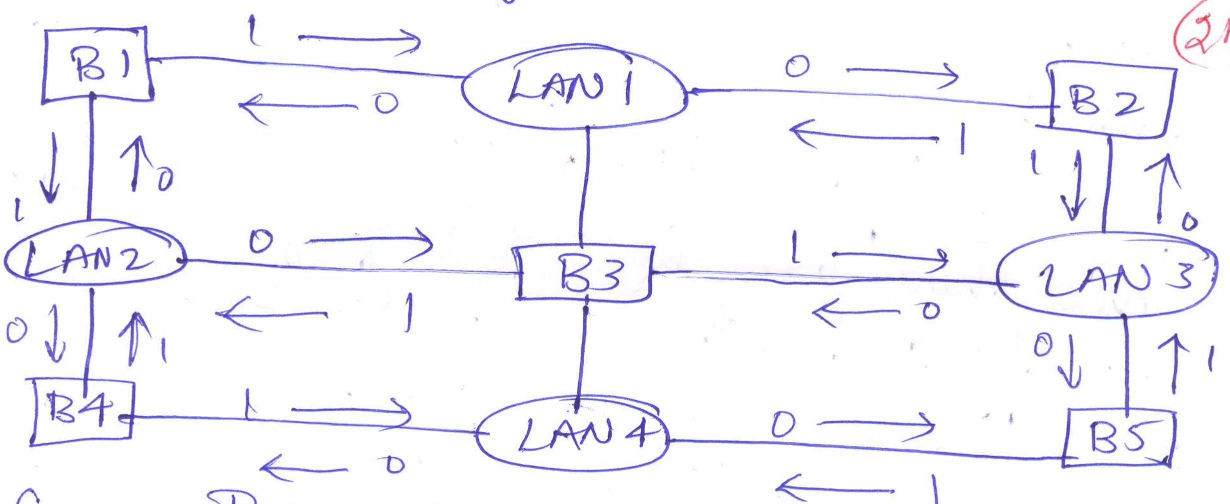
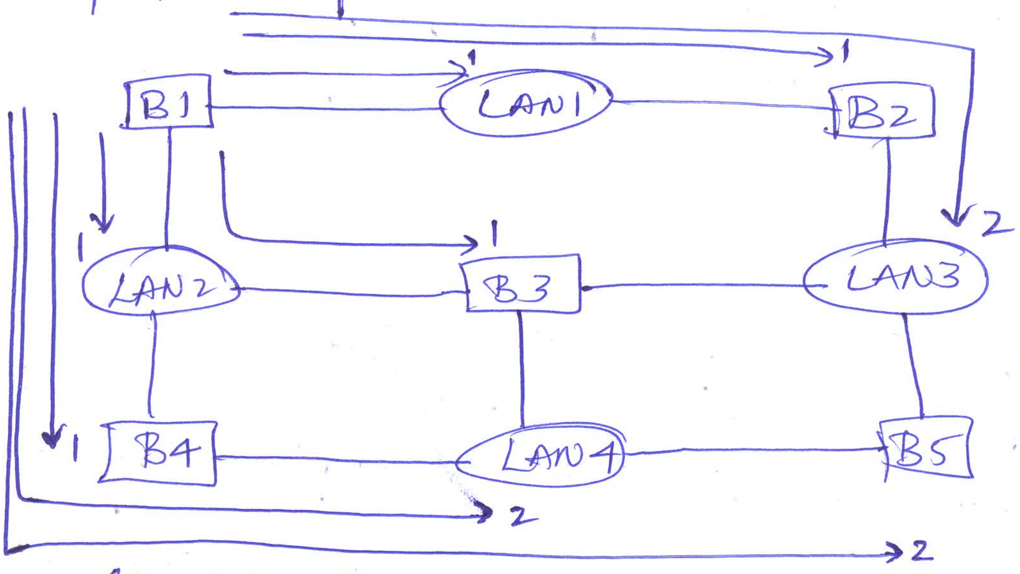


FIG: Graph Representation with cost assigned

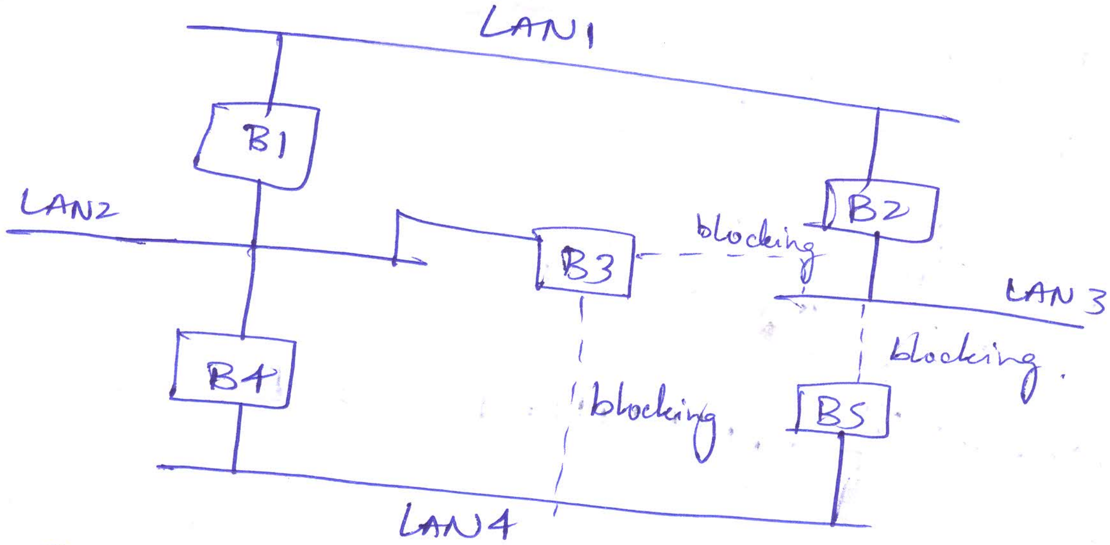
1 ½



Shortest paths

1 ½

9



OR

Q3(a) A pure ALOHA network transmits 200 bit frames on a shared channel of 200 kbps. Calculate the throughput if system produces

a) 1000 frames per second
b) 500 frames per second
c) 250 frames per second.

2

Solution:

$$T_{fr} = \frac{200 \text{ bit}}{200 \text{ kbps}} = \underline{1ms} \qquad S = G \cdot e^{-2G}$$

i) $G = 1$

$$S = 1 \cdot e^{-2(1)} = \underline{0.135}$$

$S = 13.5\%$. hence 135 frames out of 1000 frames are collision free

ii) $G = 1/2$

$$S = \frac{1}{2} e^{-2 \cdot \frac{1}{2}} = \frac{1}{2e} = 0.1839$$

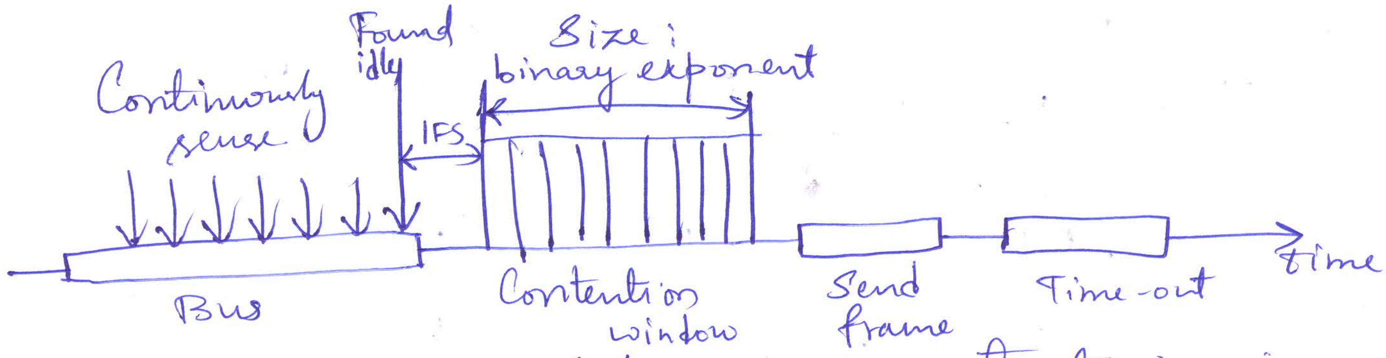
⇒ 92 frames out of 500 are collision free

iii) $G = 0.25$

$$S = 0.25 \, e^{-2 \times 0.25} = 0.1516$$

⇒ 38 frames out of 250 are collision free

b) Explain CSMA with collision avoidance with necessary diagrams.



* Collisions are avoided using 3 strategies in the CSMA/CA. They are Interframe space, the contention window and acknowledgements.

<u>Interframe space (IFS)</u>

* When an idle channel is found, the station does not send data immediately. It waits for a period of time called IFS.
* Waiting is because, eventhough the channel appear idle when it is sensed, a distant station may have already transmitted and the signal is not yet reached this station.
* IFS time allows the front of the transmitted signal by the distant station to reach this station
* Even after the IFS time, the channel is idle, the station can send, but it still needs to wait a time equal to contention time.
* The IFS variable can also be used to prioritize station or frame types

(1½M)

* Contention window

- The contention window is an amount of time divided into slots.
- A station that is ready to send chooses random number R between 0 to $2^k - 1$ as it's wait time.
- The number of slots in the window changes according to binary exponential back-off strategies.
- In CSMA/CA, if station ~~fails~~ finds the channel busy, it does not restart the timer of contention window. It stops the timer and restarts it when the channel becomesidle.

[1 1/2 m]

Acknowledgement

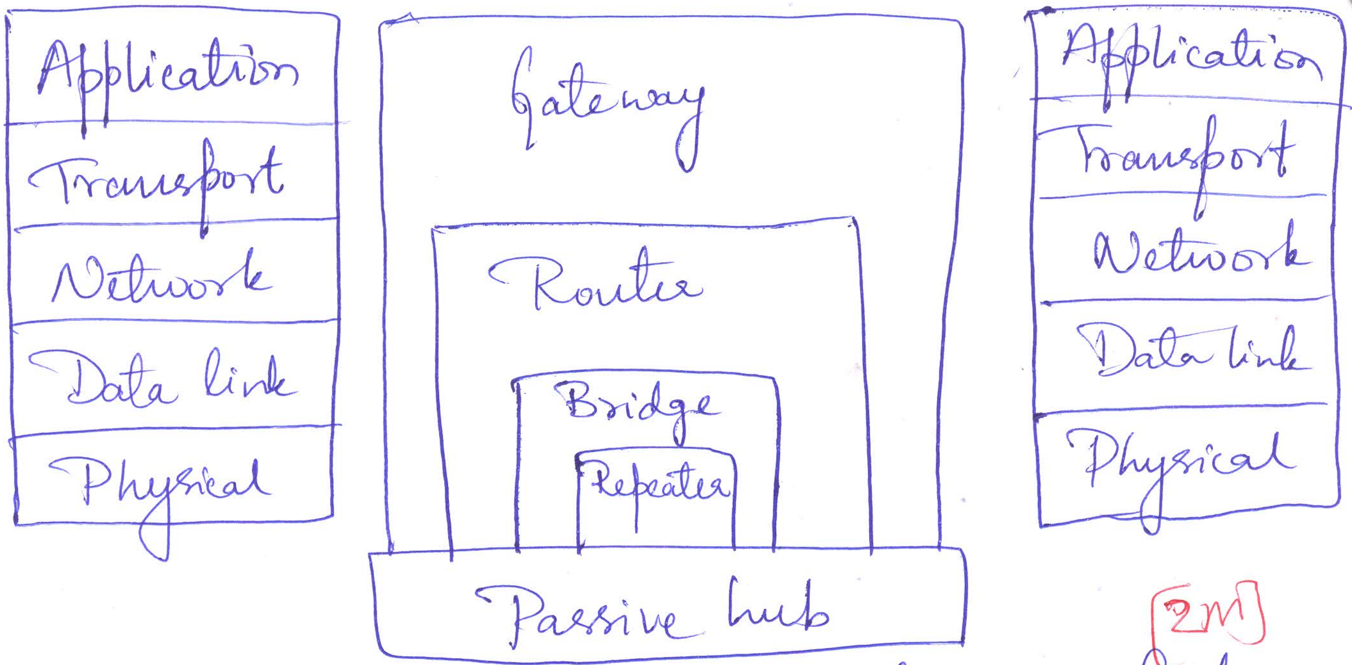
- There may be a chances that data may be corrupted during transmission
- The positive acknowledgement and the time-out helps or guarantees that the receiver has received the frame.

– [2 m]

Draw and list different connecting devices on the basis of layer they operate.

Solution:

* Connecting devices divided into five different categories based on the layer in which they operate in a network.



[2M]

The five categories contain devices which can be defined as

1. Those which operate below physical layer:

<u>Passive hub</u>.

* It is just a connector.
* It connects wires of different branches
* Hub is a collision point.

2. Those which operate at physical layer:

<u>Repeater</u> - [2M]

* Repeater is a device that operate only in the physical layer.
* Signals that carry information within a network can travel a fixed distance before attenuation endangers the integrity of data.
* It receives a signal before it becomes too weak or corrupted and regenerates the original bit pattern.

3. Those which operate at physical and data link layers;

Bridge

* As a physical layer device it regenerates the signal it receives.
* As a data link layer device, the bridge check the physical (MAC) address of source and destination ~~toto~~ contained in frame
* Bridge has filtering capability.

4. Those which operate at physical, data link and network layer;

Router:

* A router is a device that routes packets based on their logical addresses.
* It connects LANs and WANs in the Internet.
* It has a routing table that is used for making decisions about route.

5. Those which operate at all the layers;

Gateway

* A gateway is normally a computer that operates in all five layers
* It takes an application message, reads it and interprets it.
* It is used as connecting device between two internetworks, that use different models.

Q4(b) With a neat diagram explain Virtual LAN briefly.

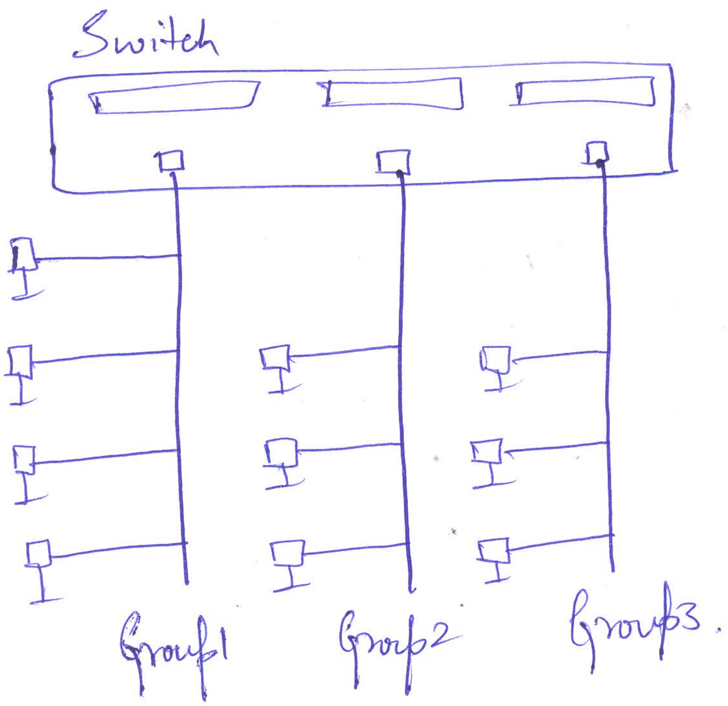


FIG:(a) A switch connecting three LANs

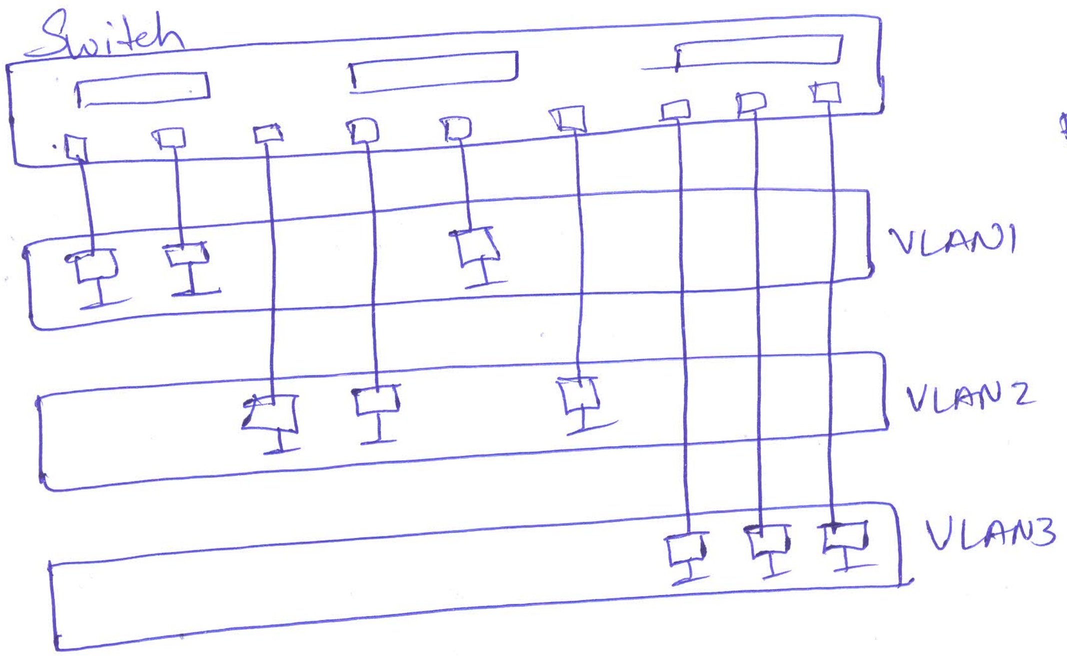


FIG:(b) A switc
using
VLAN
softwa

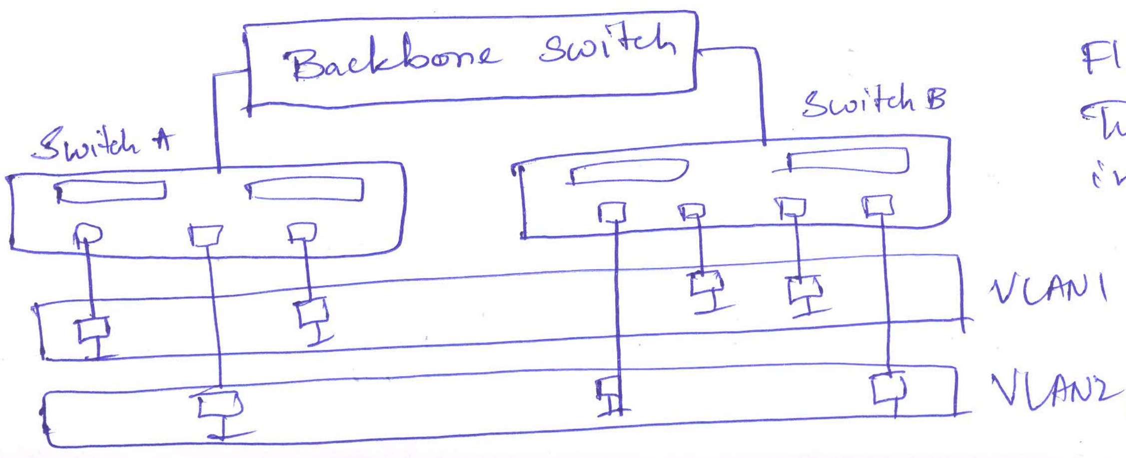


FIG:(c) Two switch
in a bac
using
VLAN
soft

(3m)

* A virtual Local area network (VLAN) is defined as a LAN configured by software, not by physical wiring.

* FIG (a) shows a switched LAN connecting 3 groups. There is a problem ie., changes in work group mean physical changes in the network configuration.

* FIG (b) shows same switched LAN divided into VLANs.
The whole idea of VLAN technology is to divide a LAN into logical, instead of physical segments.
Moving engineers from one group to another through software is easier than changing the configuration of physical network

* FIG (c) show VLAN technology that allows the grouping of stations connected to different switches in a VLAN.

[3M]

25a) Briefly discuss the following forwarding techniques
1) Next hop versus Route method
2) Network specific method versus host specific method
and default method.

Solution :

Next Hop method versus Route method

Routing tables based on route

Routing tables based on next hop.

Routing table for host A

Destination	Route
Host B	R1, R2, Host B

Destination	Next hop
Host B	R1

Routing table for R1

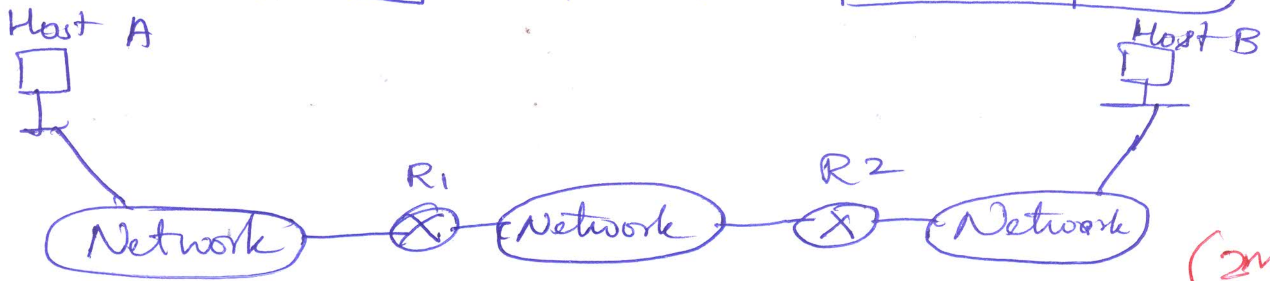
Destination	Route
Host B	R2, host B

Destination	Next hop
Host B	R2

Routing table for R2

Destination	Route
Host B	Host B

Destination	Next hop
Host B	—



(2m)

In next hop method, the routing table holds only the address of next hop instead of information about complete route.

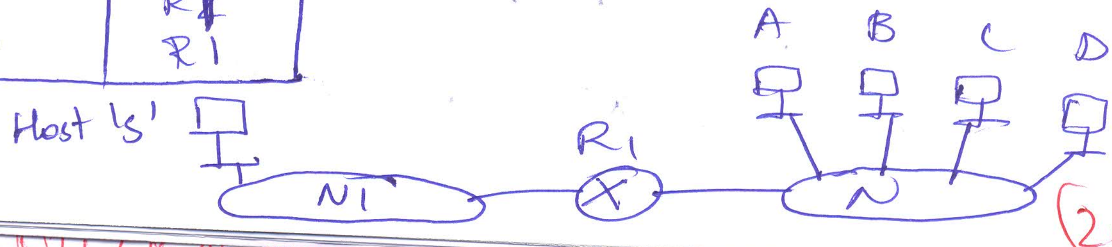
Network Specific and Host-Specific method.

Routing table for hosts based on host-specified method

Destination	Next hop
A	R1
B	R1
C	R1
D	R1

Routing table for hosts based on network specific method

Destination	Next hop
N2	R1



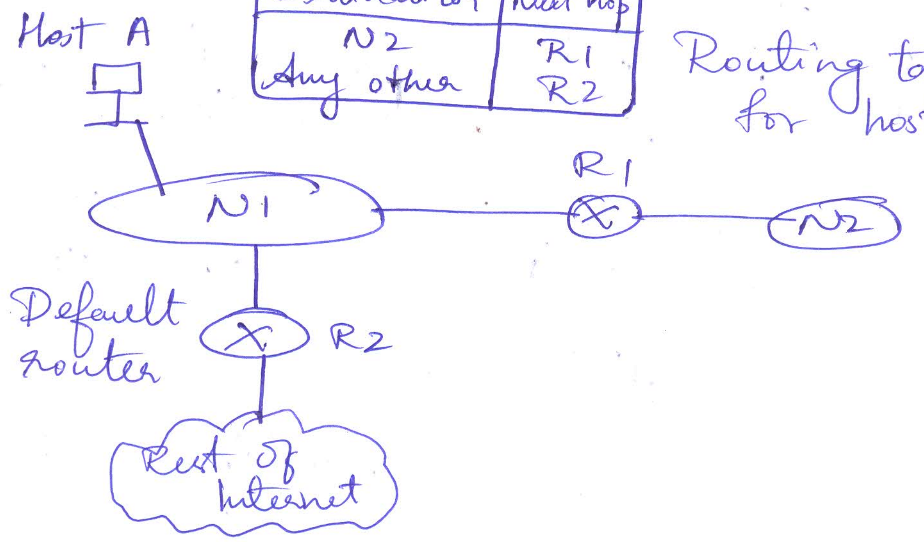
(2m)

* Here, instead of having an entry for every destination host connected to the same physical network, we have only one entry that defines the address of destination network itself. ie., we treat all hosts connected to the same n/w as one single entity.

Default method

Destination	Next hop
N2	R1
Any other	R2

Routing table for host A.



[2m]

* Host A is connected to a n/w with 2 routers.
* R1 routes packet to hosts connected to n/w N2. However, for rest of Internet R2 is used.

Q5b) Differentiate multicasting and multiple unicasting

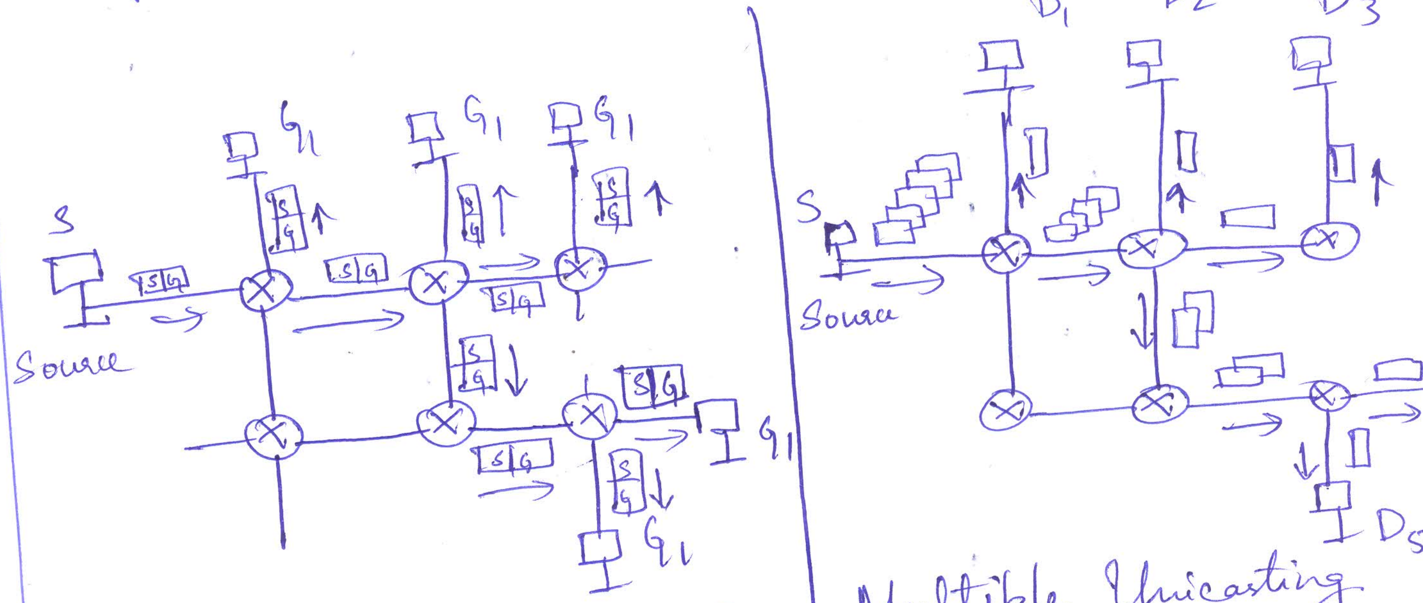
Solution:

Multicasting starts with one single packet from the source that is duplicated by the router. The destination address in each packet is the same for all duplicates

Only one single copy of packet travels between any 2 routers.

* **Multiple Unicasting**, several packets start from the source.
- There may be multiple copies travelling between 2 routers.

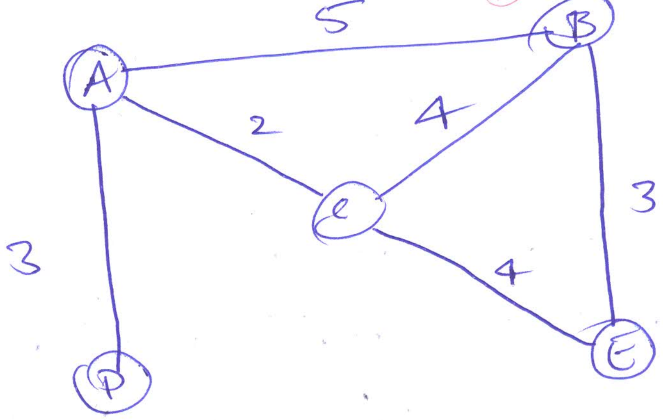
Eg: Email sent to a group of people.

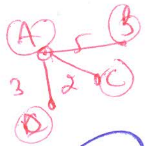


Multicasting (2M)

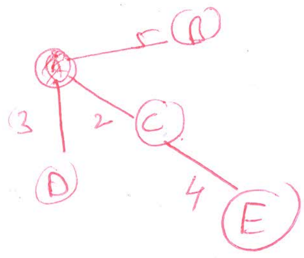
Multiple Unicasting (4M)

Q6) Illustrate Distance vector algorithm for given network



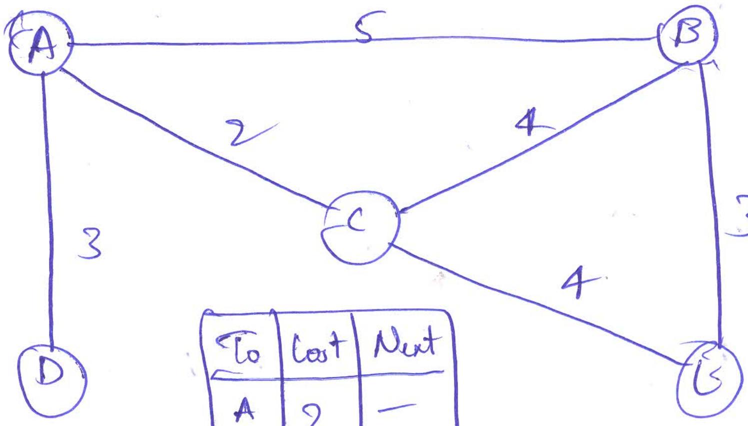


P2	T2
A(0)	B(5), C(2), D(
A(0), C(0)	B(5), C(2), D(..E(4)



To	Cost	Next
A	0	–
B	5	–
C	2	–
D	3	–
E	6	C

A's table



To	Cost	Next
A	5	–
B	0	–
C	4	–
D	8	A
E	3	–

B's table

To	Cost	Next
A	3	–
B	8	A
C	5	A
D	0	–
E	9	A

D's table

To	Cost	Next
A	2	–
B	4	–
C	0	–
D	5	A
E	4	–

C's table

To	Cost	Next
A	6	C
B	3	–
C	4	–
D	9	C
E	0	–

E's table

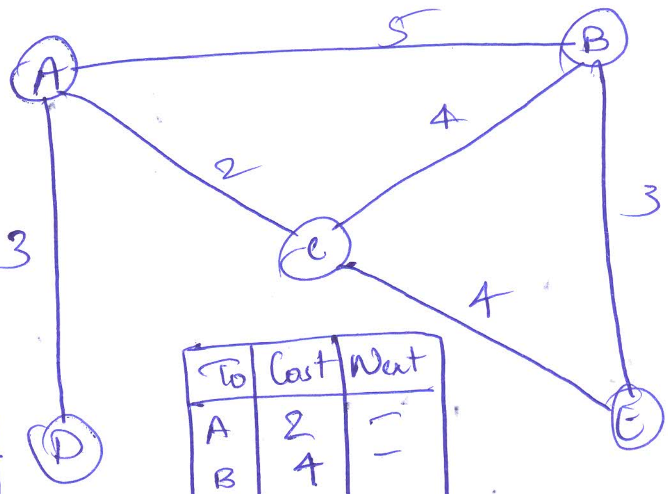
FIG: Distance vector routing table.

Steps to arrive at this table:

Step: 1 Initialization of tables in distance vector routing

To	Cost	Next
A	0	–
B	5	–
C	2	–
D	3	–
E	∞	–

A's table



To	Cost	Next
A	5	–
B	0	–
C	4	–
D	∞	
E	3	–

B's table

To	Cost	Next
A	3	–
B	∞	
C	∞	
D	0	–
E	∞	

D's table

To	Cost	Next
A	2	–
B	4	–
C	0	–
D	∞	
E	4	–

C's table

To	Cost	Next
A	∞	
B	3	–
C	4	–
D	∞	
E	0	–

E's table.

Step:2 The receiving node needs to add name of the sending node to each row as the 3rd column if the receiving node uses any info. from any row.

To	Cost	Next
A	2	–
B	4	–
C	0	–
D	∞	–
E	4	–

A received from C

→

To	Cost	Next
A	4	C
B	6	C
C	2	C
D	∞	C
E	6	C

A's modified table

(3m)

Step:3 The receiving node needs to compare each row of it's old table with the corresponding new table.

To	Cost	Next
A	4	C
B	6	C
C	2	C
D	∞	C
E	6	C

A's modified table

→ Compare ←

To	Cost	Next
A	0	–
B	5	–
C	2	–
D	3	–
E	∞	

A's old table

↓

To	Cost	Next
A	0	–
B	5	–
C	2	–
D	3	–
E	6	C

table

(3m)

1a) Explain different fields in the routing table? What are the significance of flags field.

Solution:

Mask	Network address	Next-hop address	Interface	Flags	Reference Count	Use
....						

Fig: Common fields in a routing table. (2M)

Mask: This field defines the mask applied for the entry.

Network address; This field defines the n/w address to which the packet is finally delivered.

Next-hop address: This field defines the address of the next hop router to which the packet is delivered.

Interface: This field shows the name of the interface

Flags: This field defines upto 5 flags.

→ U (UP)
→ G (gateway)
→ H (Host-specific)
→ D (added by redirection)
→ M (modified by redirection)

Flags are on/off switches that signify either presence or absence.

(2M)

Reference count: This field defines (gives) the number of users of this route at the moment.

Use: This field shows the number of packets transmitted through this router for the corresponding destination.

* A dynamic routing table is updated periodically by using one of the dynamic routing protocols such as RIP, OSPF or BGP.

Q7b) Expand the following IPv6.

1) 0::0

0000:0000:0000:0000:0000:0000:0000:0000

2) 0:ABC::0 (1M)

0000:0ABC:0000:0000:0000:0000:0000:0000

Q7c) Find the subnet address for the following (1M)

IP address	Mask
125.54.12.56	255.255.0.0
141.181.80.16	255.255.224.0

	IP	Mask
i)	125.54.12.56	255.255.0.0

Mask /n = 16

125.54.12.56 in binary

IP 0111 1101 0011 0110 0000 1100 0011 1000

AND operation

1111 1111 1111 1111 0000 0000 0000 0000

First address

0111 1101 0011 0110 0000 0000 0000 0000

⇒ 125.54.0.0.

Last address:

IP 0111 1101 0011 0110 0000 1100 0011 1000

OR

Mask 0000 0000 0000 0000 1111 1111 1111 1111

⇒ 0111 1101 0011 0110 1111 1111 1111 1111

⇒ 125.54.255.255 (2M)

ii) 141.181.80.16 255.255.224.0.

/n = 19

First address

IP 1000 1101 1011 0101 0101 0000 0001 0000

AND

MASK 1111 1111 1111 1111 1110 0000 0000 0000

FA 1000 1101 1011 0101 0100 0000 0000 0000

⇒ 141.181.64.0

Last address

IP 1000 1101 1011 0101 0101 0000 0001 0000

OR

MASK 0000 0000 0000 0000 0001 1111 1111 1111

1000 1101 1011 0101 0101 1111 1111 1111

⇒ 141.181.95.255 (2M)