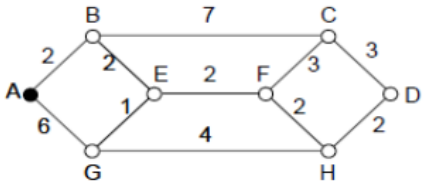
Ch-5 :The Network Layer Numerical

Q. 1. **Consider the following network, but ignore the weights on the lines. Suppose that it uses flooding as the routing algorithm. If a packet sent by A to D has a maximum hop count of 3, list all the routes it will take. Also tell how many hops worth of bandwidth it consumes.**

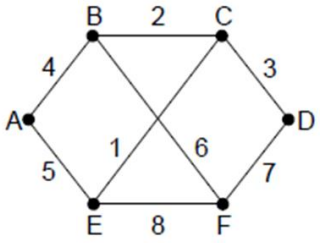


(a)

Solution:

It will follow all of the following routes: ABCD, ABCF, ABEF, ABEG, AGHD, AGHF, AGEB, and AGEF. The number of hops used is 24.

Q.2 **Consider the subnet of Fig. 5-13(a) as shown below. Distance vector routing is used, and the following vectors have just come in to router C: from B: (5, 0, 8, 12, 6, 2); from D: (16, 12, 6, 0, 9, 10); and from E: (7, 6, 3, 9, 0, 4). The measured delays to B, D, and E, are 6, 3, and 5, respectively. What is C's new routing table? Give both the outgoing line to use and the expected delay.**



(a)

Solution:

B' table

A	5
B	0
C	8
D	12
E	6
F	2

D's table

A	16
B	12
C	6
D	0
E	9
F	10

E'S Table

A	7
B	6
C	3
D	9
E	0
F	4

The measured delays to B, D, and E, are 6, 3, and 5, respectively.

Going via B gives (**A-11, B-6**, C-14, D-18, E-12, **F- 8**).

Going via D gives (A-19, B-15, C- 9, **D-3**, E-9, F-10).

Going via E gives (A-12, B-11, C- 8, D-14, **E-5**, F- 9).

Taking the minimum for each destination except C gives (11, 6, 0, 3, 5, 8).

The outgoing lines are (B, B, –, D, E, B).

Q. 3 If delays are recorded as 8-bit numbers in a 50-router network, and delay vectors are exchanged twice a second, how much bandwidth per (full-duplex) line is chewed up by the distributed routing algorithm? Assume that each router has three lines to other routers.

Solution:

The routing table is 400 bits. Twice a second this table is written onto each line, so 800 bps are needed on each line in each direction.

Q. 4

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

a. 114.34.2.8

b. 129.14.6.8

c. 208.34.54.12

d. 238.34.2.1

Solution:

a. 01110010 00100010 00000010 00001000
b. 10000001 00001110 00000110 00001000
c. 11010000 00100010 00110110 00001100
d. 11101110 00100010 00000010 00000001

Q. 5

Find the class of the following IP addresses.

a. 208.34.54.12
b. 238.34.2.1
c. 114.34.2.8
d. 129.14.6.8

Solution:

a. Class C
b. Class D
c. Class A
d. Class B

Q. 6 **Convert the IP address whose hexadecimal representation is C22F1582 to dotted decimal notation.**

Solution:

The address is 194.47.21.130

Q. 7 **A network on the Internet has a subnet mask of 255.255.240.0. What is the maximum number of hosts it can handle?**

Solution:

. The mask is 20 bits long, so the network part is 20 bits. The remaining 12 bits are for the host, so 4096 host addresses exist.

Q. 8 **A large number of consecutive IP address are available starting at 198.16.0.0. Suppose that four organizations, A, B, C, and D, request 4000, 2000, 4000, and 8000 addresses, respectively, and in that order. For each of these, give the first IP address assigned, the last IP address assigned, and the mask in the w.x.y.z/s notation.**

Solution:

To start with, all the requests are rounded up to a power of two. The starting address, ending address, and mask are as follows:

A: 198.16.0.0 – 198.16.15.255 written as 198.16.0.0/20

B: 198.16.16.0 – 198.23.15.255 written as 198.16.16.0/21

C: 198.16.32.0 – 198.47.15.255 written as 198.16.32.0/20

D: 198.16.64.0 – 198.95.15.255 written as 198.16.64.0/19

Q. 9 **A router has just received the following new IP addresses: 57.6.96.0/21, 57.6.104.0/21, 57.6.112.0/21, and 57.6.120.0/21. If all of them use the same outgoing line, can they be aggregated? If so, to what? If not, why not?**

Solution:

They can be aggregated to 57.6.96/19

Q.10 **A router has the following (CIDR) entries in its routing table: Address/mask Next hop 135.46.56.0/22 Interface 0 135.46.60.0/22 Interface 1 192.53.40.0/23 Router 1 default Router.**

For each of the following IP addresses, what does the router do if a packet with that address arrives? a. (a) 135.46.63.10 b. (b) 135.46.57.14 (c) 135.46.52.2 d. (d) 192.53.40.7 e. (e) 192.53.56.7

Solution:

The packets are routed as follows:

(a) Interface 1 (b) Interface 0 (c) Router 2 (d) Router 1 (e) Router