CS 204 : COMPUTER NETWORKS

Assignment – 03

Roll no : 180010011

1. In the Ipv4 addressing format, the number of networks allowed under Class C addresses is **2^{21}.**

2. **Class C network**

3. In a classful addressing, first three bits in Class C IP address is **110.**

4. Given subnet mask is 255.255.248.0
Binary representation of given subnet mask is 11111111.11111111.11111000.00000000
Number of bits left (h) = 11
Maximum no. of hosts = 2^h - 2
= 2^{11} – 2 = 2048 – 2 = 2046

5. Ans : D
Because IP1 is 128.8.129.43 and IP2 is 128.8.161.55
Bitwise representation of IP1 is 10000000.00001000.10000001.00101011
IP2 is 10000000.00001000.10100001.00110111
IP1 (BITWISE AND) M = 10000000.00001000.10000001.00101011
IP2 (BITWISE AND) M = 10000000.00001000.10100001.00110111
IP1 (BITWISE AND) M = IP2 (BITWISE AND) M

6. 125.134.96.0

7. Given Network IP is 172.16.0.0 and subnet mask address is 255.255.0.0
Network Ip in binary representation in 10101100.00010000.00000000.00000000
Subnet mask address in binary representation is 11111111.11111111.00000000.00000000
Broadcast address is 172.16.255.255

8. Routing table for node A: (initial)

Destination	Distance Value	Next Hop
A	0	A
B	4	B
C	infinity	
D	infinity	
E	infinity	

Routing table for node B: (initial)

Destination	Distance Value	Next Hop

A	4	A
B	0	B
C	1	C
D	infinity	
E	5	E

Routing table for node C: (initial)

Destination	Distance Value	Next Hop
A	infinity	
B	1	B
C	0	C
D	7	D
E	infinity	

Routing table for node D: (initial)

Destination	Distance Value	Next Hop
A	infinity	
B	infinity	
C	7	C
D	0	D
E	2	E

Routing table for node E: (initial)

Destination	Distance Value	Next Hop
A	infinity	
B	5	B
C	infinity	
D	2	D
E	0	E

By Applying distance vector algorithm:

$d_A(B) = 4$

Shortest path: A to B

$d_A(C) = \min\{d_A(B) + c(B, C), d_A(B) + c(B, E) + c(E, D) + c(D, C)\} = \min\{4+1, 4+5+2+7\}$

$= \min\{5, 18\} = 5$

Shortest path: A to B to C

$d_A(D) = \min\{d_A(B) + c(B, E) + c(E, D), d_A(B) + c(B, C) + c(C, D)\} = \min\{4+5+2, 4+1+7\}$

$= \min\{11,12\} = 11$

Shortest path: A to B to E to D

$d_A(E) = \min\{d_A(B) + c(B, E), d_A(B) + c(B, C) + c(C, D) + c(D, E)\} = \min\{4+5, 4+1+7+2\}$

$= \min\{9, 14\} = 9$

Shortest path: A to B to E

$d_B(C) = \min\{c(B, E) + c(E, D) + c(D, C), c(B, C)\} = \min\{5+2+7, 1\} = \min\{14, 1\} = 1$

Shortest path: B to C

$d_B(D) = \min\{c(B, E) + c(E, D), c(B, C) + c(C, D)\} = \min\{5+2, 1+7\} = \min\{7, 8\} = 7$

Shortest path: B to E to D

$d_B(E) = \min\{c(B, E) , c(B, C) + c(C, D) + c(D, E)\} = \min\{5, 1+7+2\} = \min\{5, 10\} = 5$

Shortest path: B to E

$d_C(D) = \min\{c(C, D) , c(C, B) + c(B, E) + c(E, D)\} = \min\{7, 1+5+2\} = \min\{7, 8\} = 7$

Shortest path: C to D

$d_C(E) = \min\{c(C, B) + c(B, E), c(C, D) + c(D, E)\} = \min\{5+1, 7+2\} = \min\{6, 9\} = 6$

Shortest path: C to B to E

$d_D(E) = \min\{c(D, E), c(D, C) + c(C, B) + c(B, E)\} = \min\{2, 7+1+5\} = \min\{2, 13\} = 2$

Final Routing tables:
Routing table for node A:

Destination	Distance Value	Next Hop
A	0	A
B	4	B
C	5	B
D	11	B
E	9	B

Routing table for node B:

Destination	Distance Value	Next Hop
A	4	A
B	0	B
C	1	C
D	7	E
E	5	E

Routing table for node C:

Destination	Distance Value	Next Hop
A	5	B
B	1	B
C	0	C
D	7	D
E	6	B

Routing table for D:

Destination	Distance Value	Next Hop
A	11	E
B	7	E
C	7	C
D	0	D
E	2	E

Routing table for E:

Destination	Distance Value	Next Hop
A	9	B
B	5	B
C	6	B
D	2	D
E	0	-

9. 1.

a. Minimum distance from A to E is 8(A>B>C>E)(5+2+1)
b. Minimum distance from A to D is 7(A>B>D)(5+2)

2. O(V+E). It can be further optimized by using a Min Heap of vertices for which shortest distance isn’t finalized yet. Min Heap is used as a priority queue to get the minimum distance vertex from set of not yet included vertices. Time complexity of operations like extract-min and decrease-key value is O(LogV) for Min Heap.