National University of Computer and Emerging Sciences, Lahore Campus

	Course Name:	Data Communication & Networks	Course Code:	EE2007
	Program:	BS Electrical Engineering	Semester:	Fall 2025
	Assignment Submission Date:	04-December 2025	Total Marks:	10
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	Section:	BEE-5A & BEE-5B	Page(s):	1
	Exam Type:	Assignment-3	CLO #	4

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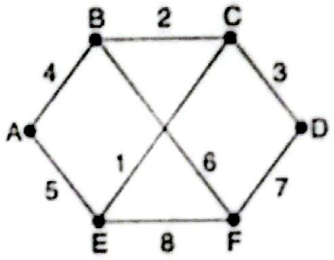
Instructions:

1. **Please attach the question paper of this assignment at the front of your solution copy.**
2. **Please do not remove CLOs mentioned at the beginning of the assignment questions.**
3. **The deadline to submit the assignment is 19 February 2025.**

Question No. 1 (CLO No. 4) **Marks: 5**

Consider the network of Figure 1. Distance vector routing is used, and the following link state packets have just come in at router D. The cost of the links are also mentioned in the Figure.



(a) **Demonstrate** the initial distance-vector routing table for every destination and nodes.

(b) **Demonstrate** the updated routing table after solving all the Count-to-infinity scenario.

Question No. 2 (CLO No. 4) **Marks: 5**

An ISP is granted a block of addresses starting with190.100.0.0/16 (65,536 addresses). The ISP needs to distribute these addresses to three groups of customers as follows:

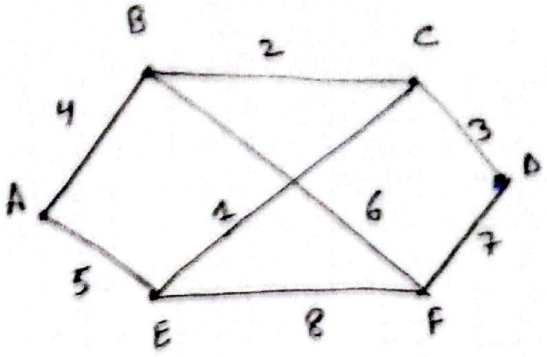
a. The first group has 64 customers; each needs 256 addresses.

b. The second group has 128 customers; each needs 128 addresses.

c. The third group has 128 customers; each needs 64 addresses

Demonstrate how many addresses are still available after these allocations.

Ques#1



(a)

Local Routing table A

Dest.	Dist.	Next node
A	0	A
B	4	B
C	∞	-
D	∞	-
E	5	E
F	∞	-

Local Routing table B

Dest.	Dist.	Next Node
A	4	A
B	0	B
C	2	C
D	∞	-
E	∞	-
F	6	F

Local Routing table D

Dest.	Dist.	Next Node
A	∞	—
B	∞	-
C	3	C
D	0	D
E	∞	—
F	7	F

Local Routing table E

Dest	Dist	Next Node
A	5	A
B	∞	—
C	1	C
D	∞	-
E	0	E
F	8	F

Local Routing table C

Dest.	Dist.	Next Node
A	∞	-
B	2	B
C	0	C
D	3	D
E	1	E
F	∞	-

Local Routing table F

Dest.	Dist	Next Node
A	∞	—
B	6	B
C	∞	—
D	7	D
E	8	E
F	0	F

Distance Vector:-

A	B	C	D	E	F
DV	DV	DV	DV	DV	DV
0	4	∞	∞	5	∞
4	0	2	∞	∞	6
∞	2	0	3	1	∞
∞	∞	3	0	∞	7
5	∞	1	∞	0	8
∞	6	∞	7	8	0

(b) Updated Routing tables:

A → B
B → E

B	E
DV	DV
4	5
0	∞
2	1
∞	∞
∞	0
6	8

Updated Routing table A

Dest.	Dist.	Next Node
A	0	A
B	4	B
C	6	B, C
D	09	B, C, D
E	5	E
F	13	E, F

D: A → B → C → D
= 4 + 2 + 3 = 9

Updated Routing table B

B → C
B → F
B → D

A	C	F
DV	DV	DV
0	∞	∞
4	2	6
∞	0	∞
∞	3	7
5	1	8
∞	∞	0

Dest	Dist.	Next node
A	4	A
B	0	B
C	2	C
D	09	C, D
E	03	C, E
F	06	F

D: B → C → D (C,D) = 2+7 = 5 or 4+9
A → B → F → D (F,D) = 6+7 = 13 or 17

E: B → C
C → E
• B → C → E = 3
• B → A → E = 9 (x)

Updated Routing table C

C → B → A (B, A) → 6
C → E → A (E, A) → 6

E → B
C → D
C → E

B	D	E
DV	DV	DV
4	∞	5
0	∞	∞
2	3	1
∞	0	∞
∞	∞	0
6	7	8

Dest.	Dist.	Next Node
A	6	B, A
B	2	B
C	0	D, C
D	3	D
E	1	E
F	8	B, F

* C → E → F
8 + 7 = 15

* C → B → F = 6+2 = 8
* C → D → F = 7+3 = 10

Updated Routing Table D

D → C
D → F

C	F
DV	DV
∞	∞
2	6
0	∞
3	6
1	8
∞	0

Dest.	Dist.	Next Node
A	9	C, B, A
B	5	C, B
C	3	C
D	0	D
E	4	C, E
F	7	F

F: D → F (7)

D → C → B → F
(3 + 2 + 6 = 11)

B: D → C → B (5)
D → F → B (6+7)
= 13

E: D → C → E (4)
D → F → E (7+8)
= 15

A: D → C → B → A
3+2+4 = 9

A: D → F → E → A
7+8+5 = 20

A: D → C → E → A
3+1+5 = 9

A: D → F → B → A
6+7+4 = 17

updated Routing Table E

E → C
E → A
E → F

C

DV
∞
2
0
3
1
∞

A

DV
0
4
∞
∞
5
∞

F

DV
∞
6
∞
7
8
0

Dest.	Dist.	Next Node
A	5	A
B	3	C, B
C	1	C
D	4	C, D
E	0	E
F	8	F

B: E → C → B = 2+1=3
E → A → B (9)

D: E → C → D (1+3 = 4)
E → F → D (8+7 = 15)

updated Routing Table F

F → D
F → B
F → E

D

DV
∞
∞
3
0
∞
7

B

DV
4
0
2
∞
∞
6

E

DV
5
∞
1
∞
0
8

Dest.	Dist.	Next Node
A	10	B, A
B	6	B
C	8	B, C
D	7	D
E	8	E
F	0	F

F: F → B → A (6+4 = 10)
F → E → A (8+5 = 13)

C: F → B → C (6+2 = 8)
F → D → C (7+3 = 10)

Distance Vector after 1st iteration:

A	
DV	
0	
4	
6	
9	
5	
13	

B	
DV	
4	
0	
2	
9	
3	
6	

C	
DV	
6	
2	
0	
3	
1	
8	

D	
DV	
9	
5	
3	
0	
4	
7	

E	
DV	
5	
3	
1	
4	
0	
8	

F	
DV	
10	
6	
8	
7	
8	
0	

Ques # 2

ISP owns block:

190.100.0.0/16

Total address $= 2^{16} = 65,536$

1) Group A Allocation:

- 64 customers.
- Each needs 256 addresses.

256 addresses $\rightarrow 2^8 \rightarrow$ requires 124 blocks.

Total address used

$= 64 \times 256 = 16,384.$

2) Group B Allocation:

- 128 customers
- Each need 128 addresses.

128 address $= 2^7 \longrightarrow$ requires / 25 blocks.

Total Address used:

$128 \times 128 = 16,384$.

3) Group C Allocation:

- 128 customers.
- Each needs 64 address.

64 address $= 2^6 \rightarrow$ requires / 26 blocks.

Total Address used

$= 128 \times 64 = 8192$.

Group A : 16,384
Group B : 16,384
Group C : 8,192

40,960

Total available : 65,536
Total allocated : 40,960

24,576 → Remaining

The ISP still has 24,576 unused IP addresses available.