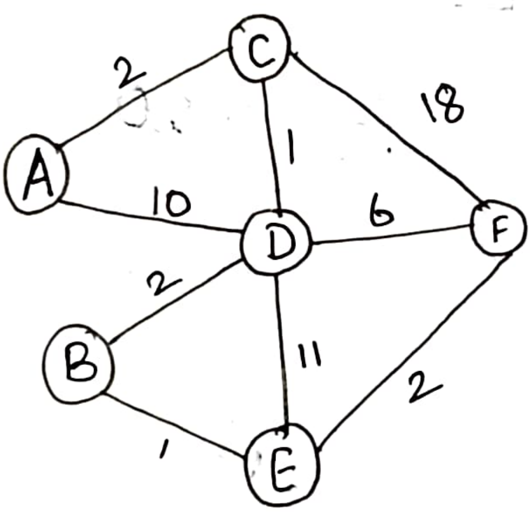
* Link State Routing Algorithm:

$$\boxed{\begin{array}{l} \text{if } d(i) + c(i,j) < d(j) \\ \text{then} \\ d(j) = d(i) + c(i,j) \end{array}}$$



* Step 1: Construct Cost Matrix

$$\begin{array}{c} \\ A \\ B \\ C \\ D \\ E \\ F \end{array} \begin{array}{c} \begin{array}{cccccc} A & B & C & D & E & F \end{array} \\ \begin{bmatrix} 0 & \infty & 2 & 10 & \infty & \infty \\ \infty & 0 & \infty & 2 & 1 & \infty \\ 2 & \infty & 0 & 1 & \infty & 18 \\ 10 & 2 & 1 & 0 & 11 & 6 \\ \infty & 1 & \infty & 11 & 0 & 2 \\ \infty & \infty & 18 & 6 & 2 & 0 \end{bmatrix} \end{array}$$

Step 2: Finding Minimal costs to all Nodes from A.

→ Initialize Node A with 0 and all other nodes with ∞.

→ At every step pick the node with minimal cost and add to S.

→ Apply,

$$\text{if } d(i) + c(i,j) < d(j)$$
$$\text{then } d(j) = d(i) + c(i,j)$$

to find minimal cost.

	S	A	B	C	D	E	F
1	∅	$\boxed{0}$	∞	∞	∞	∞	∞
2	{A}	0	∞	$\boxed{2}$	10	∞	∞
3	{A,C}	0	∞	2	$\boxed{3}$	∞	20
4	{A,C,D}	0	$\boxed{5}$	2	3	14	9
5	{A,C,D,B}	0	5	2	3	$\boxed{6}$	9
6	{A,C,D,B,E}	0	5	2	3	6	$\boxed{8}$

Path: A C D B E F

① All nodes except A are initialized to ∞. $A \to 0$

② Add A to S, since it has minimal cost of 0.

Update C & D

$$\to d(C) \Rightarrow d(A) + C(A, C) < d(C)$$

$$0 + 2 < \infty$$

$$\boxed{d(C) = 2}$$

$$\to d(D) \Rightarrow d(A) + C(A, D) < d(D)$$

$$0 + 10 < \infty$$

$$\boxed{d(D) = 10}$$

③ Add C to S, $\because$ $C = 2 \Rightarrow$ Min cost

update D & F

$$\to d(D) \Rightarrow d(C) + C(C, D) < d(D)$$

$$2 + 1 < 10$$

$$\boxed{d(D) = 3}$$

$$\to d(F) \Rightarrow d(C) + C(C, F) < d(F)$$

$$2 + 18 < \infty$$

$$\boxed{d(F) = 20}$$

④ Add D to S, ∴ D = 3 → Min Cost

Update B, E, F

→ $d(B) \Rightarrow d(D) + c(D, B) < d(B)$

$$3 + 2 < \infty$$

$$\boxed{d(B) = 5}$$

→ $d(E) \Rightarrow d(D) + c(D, E) < d(E)$

$$3 + 11 < \infty$$

$$\boxed{d(E) = 14}$$

→ $d(F) \Rightarrow d(D) + c(D, F) < d(F)$

$$3 + 6 < 20$$

$$\boxed{d(F) = 9}$$

⑤ Add B to S, ∴ B = 5 → Min Cost

Update E

→ $d(E) \Rightarrow d(B) + c(B, E) < d(E)$

$$5 + 1 < 14$$

$$\boxed{d(E) = 6}$$

For $d(F) \Rightarrow d(B) + c(B, F) < d(F)$

$$5 + \infty < 9 \times$$

∴ $\boxed{d(F) = 9}$ remains no changes.

(6) Add E to S, min cost ⇒ E = 6

Update F

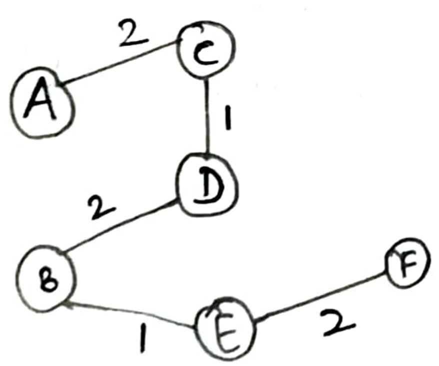
$d(F) \Rightarrow d(E) + C(E,F) < d(F)$

$6 + 2 < 9$

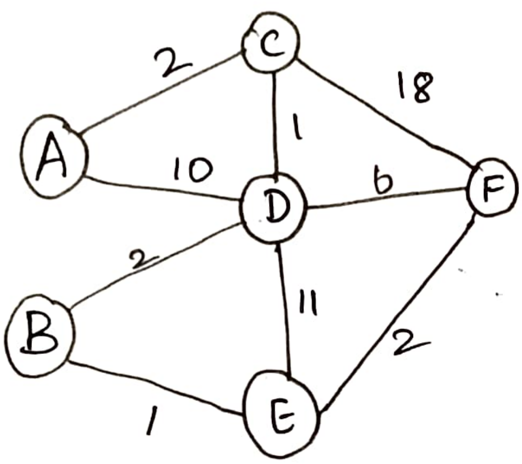
$\boxed{d(F) = 8}$

⇒ Add F to S.

Destination	Cost	Next Hop
A	0	–
B	3	D
C	2	–
D	3	C
E	6	B
F	8	E



* Distance Vector Protocol



Step 1: Initialize all nodes with cost of its neighbours

→ A:

Destination	Cost	Next hop
A	0	–
B	∞	–
C	2	–
D	10	–
E	∞	–
F	∞	–

→ B:

Destination	Cost	Next hop
A	∞	–
B	0	–
C	∞	–
D	2	–
E	1	–
F	∞	–

→ C:

Destination	Cost	Next hop
A	2	–
B	∞	–
C	0	–
D	1	–
E	∞	–
F	18	–

→ D:

Destination	Cost	Next hop
A	10	–
B	2	–
C	1	–
D	0	–
E	11	–
F	6	–

→ E:

Destination	Cost	Next Hop
A	∞	—
B	1	—
C	∞	—
D	11	—
E	0	—
F	2	—

→ F:

Destination	Cost	Next hop
A	∞	—
B	∞	—
C	18	—
D	6	—
E	2	—
F	0	—

Step 2: First Iteration:

For A:

Destination	cost	Next Hop
A	0	—
B	12	D
C	2	—
D	3	C
E	21	D
F	16	D

Neighbours of A are D & C

	C	D
A	2	10
B	∞	2
C	0	1
D	1	0
E	∞	11
F	18	6

① B: $A \to C + C \to B$ OR $A \to D + D \to B$

$A \to B$ $\quad 2 + \infty \quad\quad 10 + 2$

∞

$\boxed{A \to B = \infty; \quad A \to C + C \to B = \infty; \quad A \to D + D \to B = 12}$

Taking minimum cost: $\boxed{A \to D + D \to B = 12}$

② C:

$A \to C$
2
$\boxed{2}$

$A \to C + C \to C$
$2 + 0$
2

$A \to D + D \to C$
$10 + 1$
11

③ D:

$A \to D = 10$
10

$A \to C + C \to D$
$2 + 1$
$\boxed{3}$

$A \to D + D \to D$
$10 + 0$
10

④ E:

$A \to E = \infty$
∞

$A \to C + C \to E$
$2 + \infty$
∞

$A \to D + D \to E$
$10 + 11$
$\boxed{21}$

⑤ F:

$A \to F$
∞
∞

$A \to C + C \to F$
$2 + 18$
20

$A \to D + D \to F$
$10 + 6$
$\boxed{16}$

For B:

Destination	cost	Next Hop
A	12	D
B	0	–
C	3	D
D	2	–
E	1	–
F	3	E

Neighbour of B are D & E

D	E
10	∞
2	1
1	∞
0	11
11	0
6	2

For C:

Destination	Cost	Next Hop
A	2	–
B	3	D
C	0	–
D	1	–
E	12	D
F	7	D

Neighbour of C ⇒ A, D, F

A	D	F
0	10	∞
∞	2	∞
2	1	18
10	0	6
∞	11	2
∞	6	0

For D:

Destination	Cost	Next hop
A	3	C
B	2	–
C	1	–
D	0	–
E	3	B
F	6	–

D ⇒ A, B, C, ~~D~~, E, F

	A	B	C	E	F
A	0	∞	2	∞	∞
B	∞	0	∞	1	∞
C	2	∞	0	∞	18
D	10	2	1	11	6
E	∞	1	∞	0	2
F	∞	∞	18	2	0

For E:

Destination	Cost	Next Hop
A	21	D
B	1	–
C	12	D
D	3	B
E	0	–
F	2	–

E ⇒ B, D, F

B	D	F
∞	10	∞
0	2	∞
∞	1	18
2	0	6
1	11	2
∞	6	0

For F:

Destination	Cost	Hop
A	16	D
B	3	E
C	7	D
D	6	–
E	2	–
F	0	–

F ⇒ C, D, E,

C	D	E
2	10	∞
∞	2	1
0	1	∞
1	0	11
∞	11	0
18	6	2

* Second Iteration:

For A:

Destination	Cost	Hop
A	0	–
B	5	C
C	2	–
D	3	C
E	6	D
F	9	C

Neighbours C, D
⇒ Updated C & D from iteration 1

	C	D	Old A
A	2	3	0
B	3	2	12
C	0	1	2
D	1	0	3
E	12	3	21
F	7	6	16

1. B: A → B: 12, 12 | A → C + C → B: 2 + 3 = $\boxed{5}$ | A → D + D → B: 3 + 2 = 5

2. E: A → E: 21 | A → C + C → E: 2 + 12 = 14 | A → D + D → E: 3 + 3 = $\boxed{6}$

3. F: A → F: 16 | A → C + C → F: 2 + 7 = $\boxed{9}$ | A → D + D → F: 3 + 6 = 9

For B :

Dest	Cost	Next Hop
A	5	D
B	0	–
C	3	D
D	2	–
E	1	–
F	3	E

D & E

	D	E	old B
A	$\boxed{3}$	21	12
B	$\boxed{2}$	$\boxed{1}$	0
C	$\boxed{1}$	12	$\boxed{3}$
D	0	3	2
E	3	0	1
F	6	$\boxed{2}$	$\boxed{3}$

For C:

Dest	Cost	Hop
A	2	–
B	3	D
C	0	–
D	1	–
E	4	D
F	7	D

A	D	F	old C
0	3	16	2
12	$\boxed{2}$	3	$\boxed{3}$
2	$\boxed{1}$	7	0
3	0	6	1
21	$\boxed{3}$	2	12
16	6	0	7

For D:

Dest	Cost	Hop
A	3	C
B	2	–
C	1	–
D	0	–
E	3	B
F	6	–

A	B	C	E	F	old D
0	12	2	21	16	3
12	0	3	1	3	2
2	3	0	12	7	1
3	2	1	3	6	0
21	1	12	0	2	3
16	3	7	2	0	6

For E:

Dest	Cost	Hop
A	6	D
B	1	-
C	4	B
D	3	B
E	0	-
F	2	-

	B	D	F	Old E
A	12	3	16	21
B	0	2	3	1
C	3	1	7	12
D	2	0	6	3
E	1	3	2	0
F	3	6	0	2

* For F:

Dest	Cost	Hop
A	~~8~~ 9	C
B	3	E
C	7	D
D	3	-
E	2	-
F	0	-

	C	D	E	old E
A	$\boxed{2}$	3	21	16
B	3	2	1	3
C	0	1	12	7
D	1	0	3	6
E	12	3	0	2
F	$\boxed{7}$	6	2	0

* Next Iteration Continued, until no updates in all tables...