perplexity

solve

Let's solve the problem step by step as per the instructions:

(i) Initial Distance Vector of Every Router After Neighbor Discovery

Each router knows only the cost to its directly connected neighbors. The cost to itself is 0, and to all others is infinity (∞).

Let the routers be: **A, B, C, D, E**

From the diagram:

- A: connected to B (2), D (6), E (5)
- B: connected to A (2), C (5), D (3)
- C: connected to B (5), D (3)
- D: connected to A (6), B (3), C (3), E (2)
- E: connected to A (5), D (2)

Initial Distance Vectors

Destination	A	B	C	D	E
A	0	2	∞	6	5
B	2	0	5	3	∞
C	∞	5	0	3	∞
D	6	3	3	0	2
E	5	∞	∞	2	0

(ii) Routing Table of Every Router After DV Exchanges (A → B → C → D)

We update the distance vectors in the order: **A, then B, then C, then D**.
At each step, the router sends its current vector to its neighbors, who update their tables accordingly using the Bellman-Ford equation:

$$D_x(y) = \min\{C(x, v) + D_v(y), D_x(y)\}$$

Step 1: A Sends Its DV

Neighbors B, D, and E receive A's DV.

Update at B:

- For C: via A: 2 (B→A) + ∞ (A→C) = ∞ (no update)
- For D: via A: 2 + 6 = 8 (current is 3, so no update)
- For E: via A: 2 + 5 = 7 (current is ∞, so update to 7)

New B: | 2, 0, 5, 3, 7 |

Update at D:

- For B: via A: 6 (D→A) + 2 (A→B) = 8 (current is 3, no update)
- For C: via A: 6 + ∞ = ∞ (no update)
- For E: via A: 6 + 5 = 11 (current is 2, no update)

No change for D.

Update at E:

- For B: via A: 5 (E→A) + 2 (A→B) = 7 (current is ∞, so update to 7)
- For C: via A: 5 + ∞ = ∞ (no update)
- For D: via A: 5 + 6 = 11 (current is 2, no update)

New E: | 5, 7, ∞, 2, 0 |

Step 2: B Sends Its DV

Neighbors A, C, D receive B's DV.

Update at A:

- For C: via B: 2 (A→B) + 5 (B→C) = 7 (current is ∞, so update to 7)
- For D: via B: 2 + 3 = 5 (current is 6, so update to 5)
- For E: via B: 2 + 7 = 9 (current is 5, no update)

New A: | 0, 2, 7, 5, 5 |

Update at C:

- For A: via B: 5 (C→B) + 2 (B→A) = 7 (current is ∞, so update to 7)
- For D: via B: 5 + 3 = 8 (current is 3, no update)
- For E: via B: 5 + 7 = 12 (current is ∞, so update to 12)

New C: | 7, 5, 0, 3, 12 |

Update at D:

- For A: via B: 3 (D→B) + 2 (B→A) = 5 (current is 6, so update to 5)
- For C: via B: 3 + 5 = 8 (current is 3, no update)
- For E: via B: 3 + 7 = 10 (current is 2, no update)

New D: | 5, 3, 3, 0, 2 |

Step 3: C Sends Its DV

Neighbors B and D receive C's DV.

Update at B:

- For A: via C: 5 (B→C) + 7 (C→A) = 12 (current is 2, no update)
- For D: via C: 5 + 3 = 8 (current is 3, no update)
- For E: via C: 5 + 12 = 17 (current is 7, no update)

No change for B.

Update at D:

- For A: via C: 3 (D→C) + 7 (C→A) = 10 (current is 5, no update)
- For B: via C: 3 + 5 = 8 (current is 3, no update)
- For E: via C: 3 + 12 = 15 (current is 2, no update)

No change for D.

Step 4: D Sends Its DV

Neighbors A, B, C, E receive D's DV.

Update at A:

- For B: via D: 5 (A→D) + 3 (D→B) = 8 (current is 2, no update)
- For C: via D: 5 + 3 = 8 (current is 7, no update)
- For E: via D: 5 + 2 = 7 (current is 5, no update)

No change for A.

Update at B:

- For A: via D: 3 (B→D) + 5 (D→A) = 8 (current is 2, no update)
- For C: via D: 3 + 3 = 6 (current is 5, no update)
- For E: via D: 3 + 2 = 5 (current is 7, update to 5)

New B: | 2, 0, 5, 3, 5 |

Update at C:

- For A: via D: 3 (C→D) + 5 (D→A) = 8 (current is 7, no update)
- For B: via D: 3 + 3 = 6 (current is 5, no update)
- For E: via D: 3 + 2 = 5 (current is 12, update to 5)

New C: | 7, 5, 0, 3, 5 |

Update at E:

- For A: via D: 2 (E→D) + 5 (D→A) = 7 (current is 5, no update)
- For B: via D: 2 + 3 = 5 (current is 7, update to 5)
- For C: via D: 2 + 3 = 5 (current is ∞, update to 5)

New E: | 5, 5, 5, 2, 0 |

Final Routing Tables After All Exchanges

A

Dest	Cost	Next Hop
A	0	A
B	2	B
C	7	B
D	5	D
E	5	E

B

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

C

Dest	Cost	Next Hop
A	7	B
B	5	B
C	0	C
D	3	D
E	5	D

D

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

E

Dest	Cost	Next Hop
A	5	A
B	5	D
C	5	D
D	2	D
E	0	E

Summary:

- (i) The initial distance vectors are based only on direct links (see first table).
- (ii) After the specified order of DV exchanges (A, B, C, D), the tables above show the cost and next hop from each router to every other router[1] [2] [3].

⁂

1. https://www.geeksforgeeks.org/distance-vector-routing-dvr-protocol/
2. https://www.scaler.in/distance-vector-routing-algorithm/
3. https://www.gatevidyalay.com/distance-vector-routing-routing-algorithms/