**CN [Day - 2]**

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**Question 1:** Consider a network of 5 nodes A, B, C, D, and E connected as follows (with edge weights representing cost):

· A–B: 3

· A–C: 1

· B–D: 1

· C–D: 4

· C–E: 2

· D–E: 2

What is the shortest path from A to E using Dijkstra's Algorithm, and what is the total cost?

**Answer:**

**Using Dijkstra’s Algorithm**Start from source node A.

| **Node** | **Distance from A** | **Previous Node** | **Visited** |
| --- | --- | --- | --- |
| A | 0 | — | Y |
| B | ∞ | — | N |
| C | ∞ | — | N |
| D | ∞ | — | N |
| E | ∞ | — | N |

**Update neighbors of A**

* **A–B = 3 → Update B: Distance = 3, Previous = A**
* **A–C = 1 → Update C: Distance = 1, Previous = A**

| Node | Distance | Previous | Visited |
| --- | --- | --- | --- |
| A | 0 | — | Y |
| B | 3 | A | N |
| C | 1 | A | N |
| D | ∞ | — | N |
| E | ∞ | — | N |

**Visit next closest node → C (Distance = 1)**

* **C–D = 4 → Distance via C = 1 + 4 = 5 → Update D**
* **C–E = 2 → Distance via C = 1 + 2 = 3 → Update E**

| Node | Distance | Previous | Visited |
| --- | --- | --- | --- |
| A | 0 | — | Y |
| B | 3 | A | N |
| C | 1 | A | Y |
| D | 5 | C | N |
| E | 3 | C | N |

**Visit next closest node → B (Distance = 3)**

* **B–D = 1 → Distance via B = 3 + 1 = 4 → Update D (better than 5)**

| Node | Distance | Previous | Visited |
| --- | --- | --- | --- |
| A | 0 | — | Y |
| B | 3 | A | Y |
| C | 1 | A | Y |
| D | 4 | B | N |
| E | 3 | C | N |

**Visit E (Distance = 3)**

* **E–D = 2 → Distance via E = 3 + 2 = 5 → Not better than current D = 4 → No update**

| Node | Distance | Previous | Visited |
| --- | --- | --- | --- |
| A | 0 | — | Y |
| B | 3 | A | Y |
| C | 1 | A | Y |
| D | 4 | B | N |
| E | 3 | C | Y |

**Visit D (Distance = 4)**

**No better paths found**

Final Shortest Path Tree from A

* B via A (cost 3)
* C via A (cost 1)
* E via C (cost 3)
* D via B (cost 4)

Shortest Path from A to E:

* Path: A → C → E
* Cost: A–C = 1, C–E = 2 → Total = 3

Final Answer:

* Shortest Path from A to E: A → C → E
* Total Cost: 3

**Question 2:** An Ethernet LAN uses CSMA/CD. If the minimum frame size is 512 bits and the channel speed is 10 Mbps, what is the minimum time for transmission to ensure collision detection?

**Answer:**

**Given:**

* **Minimum frame size** = 512 bits
* **Channel speed** = 10 Mbps (megabits per second) = 10 × 10⁶ bits/sec

**Formula:**

Frame Size (Bits)

Channel Speed (bps)

Minimum Transmission Time =

= 51.2 μs

512 bits

107 bps

Calculation:

**Minimum time for transmission to ensure collision detection** = **51.2 microseconds (μs)**