Name: Rimsha Laraib
Seat no: B21110006107
Course: Design Analysis & Algorithm

Assignment

Q: Algorithms Used by Google Maps

❖ Dijkstra's Algorithm (Shortest Path)

1. Used to find the shortest route between two locations
2. Works perfectly on weighted, directed graphs
3. Guarantees the minimum total cost (eg, time or distance)
4. Core idea: expand the node with the smallest current distance estimate using a priority queue (min-heap)

Used where:
In backend routing services — to compute or update routes when the graph is small (local region) or when you're offline.

❖ A* (A-star) Algorithm (Heuristic Pathfinding)

An improvement over Dijkstra's — adds a heuristic h(n) (usually straight-line distance to goal)

Formula:
$f(n) = g(n) + h(n)$
where

$g(n)$ = cost so far,

$h(n)$ = estimated cost to destination

Much faster for large-scale maps because it doesn't explore unnecessary nodes

Used where:
In real-time route finding, navigation, and mobile apps, where response time must be quick.