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Task 3

If there are N places and M roads, that means, here, N is the number of vertices and M is the number of edges.

The time complexity for both problem 1 and problem 2 is O(NlogN). Two problems are almost same where we use dijkstra Algorithm for finding shorest path for a weighted graph and give output according to

P.T.O.

the problem.

In dijkstra algorithm, I have used priority queue (min heap) data structure to extract minimum vertices on the basis of weight. The time complexity for this is $O(\log N)$.

And, then a loop to get the edges of a vertex which can run at most E times.

to calcute these two with the outer loop which is running for N times, I get.

$$O(N \log N) + O(N+M) + \underbrace{O(N)}_{\text{this is for storing distance array.}}$$

$$= O(N \log N).$$

If the number of titans in each road, then it is an unweighted graph.

For unweighted graphs, we can use BFS to find the shortest path which costs O(N+M)

where,
N is the number of vertices and
M " " " edges.
[if we use adjacency list]

And,