CIA-1

DAA submission

Programming language : C

We consider 0-A , 1-B , 2-C , D-3 , E-4

The expected answer for the given directed , negative weighted graph is :

A->B = 3

A->C = 2

A->D = 2

A->E = 6

1. Dijkstras algorithm :

* Dijkstras algorithm is a shortest path algorithm used to calculate the minimum path between every node and the source node.
* It’s a greedy algorithm which considers the first occurrence of shortest path hence eliminating the possibilities of finding shorter paths when negative weights are encountered.
* Example : for the given graph ,

The output is :

A picture containing text

Description automatically generated

0->2->4->3 gives a shorter path for D from source but dijkstras doesn’t consider that path since the shortest path is updated as 5

Hence dijkstras gives incorrect answer with negative weights but works fine for directed graph and is a better approach compared to prims and kruskals algorithms which work with negative weights but doesn’t work for directed graphs

2)Prims algorithm :

* Prims algorithm calculates the shortest path for all nodes corresponding to its previous node and not from the source node.
* Prims doesn’t work with directed graphs and it can give incorrect answers as prims assumes the graph to be connected and all nodes to be accessible and checks both ways for distance between two nodes so the answer we get might be a disconnected spanning tree leading to a wrong conclusion.
* It can lead to skipping of nodes if a node is not being pointed by any other nodes which makes that node unvisited.

1. Kruskals algorithm :.

* Kruskals algorithm checks if the minimum spanning tree formed forms a cycle at every step and incase of directed graph it might assume that it is a cycle and leads to wrong results where it doesn’t consider a node and it remains unvisited.

Graphical user interface

Description automatically generated with low confidence

In our case , Kruskal doesn’t consider node E since it detects it as a cycle whereas our graph doesn’t form a cycle,

Conclusion : For this problem , dikstras is a better option in comparison to prims and kruskals as the answer desired is to calculate the shortest path from source node and dijkstras gives has most accuracy to the expected answer.

It gives the wrong path choice for the node with negative weights but gives right path for the remaining nodes.