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Institute of Computer Technology
B. Tech Computer Science and Engineering

Sub: Algorithm Analysis and Design

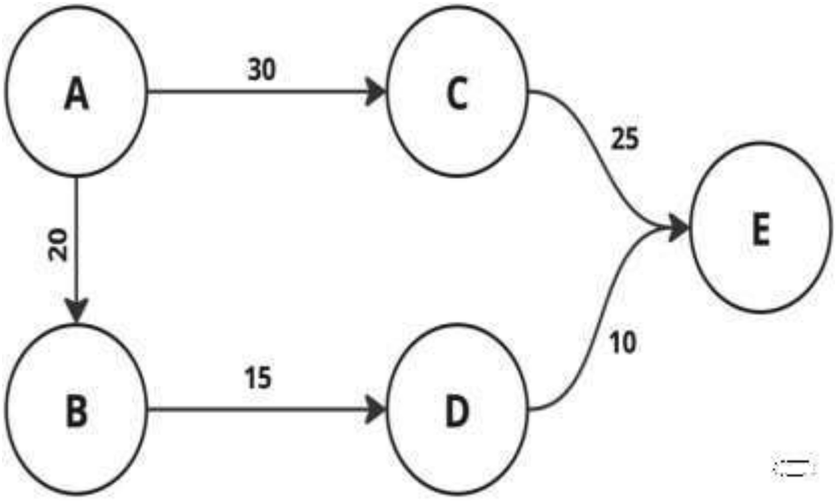
Practical 11

AIM:

A government official needs to visit several cities within a state. To minimize travel costs, they want to find the shortest path between their starting city and each destination city.

Task:

Given a graph representing the cities and their connecting roads, determine the minimum cost path from a given starting city to all other cities.



Input:

Enter total number of nodes: 5

Enter the node from where you want to calculate the distance: A

Enter Data (Weight):

	A	B	C	D	E
A	0	20	30	∞	∞
B	∞	0	∞	15	∞
C	∞	∞	0	∞	25
D	∞	∞	∞	0	10
E	∞	∞	∞	∞	0

Output:

	A	B	C	D	E
A	0	20	30	35	45
B	∞	0	∞	15	25

C	∞	∞	0	∞	25
D	∞	∞	∞	0	10
E	∞	∞	∞	∞	0

OR

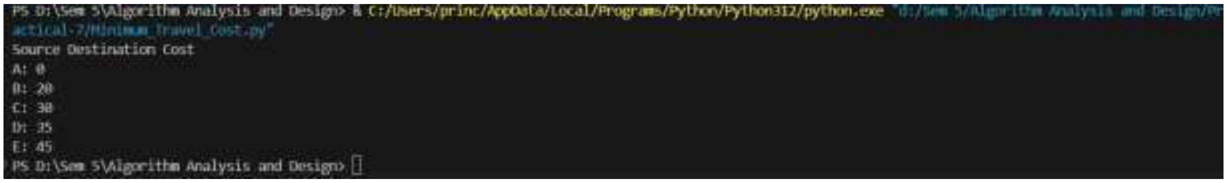
Source	Destination	Cost
A	A	0
	B	20
	C	30
	D	35
	E	45

Code :-

```
import sys


def dijkstra(graph,

    start_node): n = len(graph)

    visited = [False] * n

    distance = [sys.maxsize] *

    ndistance[start_node] = 0


    for _ in range(n):

        min_distance =

        sys.maxsize min_index =-1
        for i in range(n):
            if not visited[i] and distance[i] <
                min_distance: min_distance = distance[i]
                min_index = i
        visited[min_index] =
        True

        for j in range(n):
            if graph[min_index][j] != float('inf') and not visited[j]:
                new_dist = distance[min_index] + graph[min_index][j]
                if new_dist < distance[j]:
                    distance[j] = new_dist
    return distance

def print_distances(distance, cities):
    print("Source Destination Cost")

    for i in range(len(cities)):
        if distance[i] ==
            sys.maxsize:
            print(f"{cities[i]K: ∞")
        else:
```

```
        print(f"{cities[i]K: {distance[i]K")


cities = ['A', 'B', 'C', 'D', 'E']
graph = [
    [0, 20, 30, float('inf'), float('inf')],
    [float('inf'), 0, float('inf'), 15, float('inf')],
    [float('inf'), float('inf'), 0, float('inf'), 25],
    [float('inf'), float('inf'), float('inf'), 0, 10],
    [float('inf'), float('inf'), float('inf'), float('inf'), 0]
]


start_city = 'A'
start_node = cities.index(start_city)
distances = dijkstra(graph,
start_node) print_distances(distances,
cities)
```

<u>Output :-</u>



```
PS D:\Sem 5\Algorithm Analysis and Design> & C:/Users/princ/AppData/Local/Programs/Python/Python312/python.exe "d:/Sem 5/Algorithm Analysis and Design/Pr
actical-7/Minimum_Travel_Cost.py"
Source Destination Cost
A: 0
B: 20
C: 30
D: 35
E: 45
PS D:\Sem 5\Algorithm Analysis and Design> 
```