PROGRAM TITLE 09

TRAVELLING SALESMAN PROBLEM

AIM:

To Write the python to implement Travelling Salesman Problem.

PROCEDURE:

1. **Subset Enumeration:** Enumerate all subsets of cities, excluding the starting city.
2. **Compute Optimal Subtour:** For each subset, compute the shortest possible tour that starts at the starting city, includes all cities in the subset, and ends at any city in the subset.
3. **Optimal Tour:** The optimal tour is the one with the minimum total distance among all computed subtours.

4. **Brute Force Approach**: Implement the brute force approach to solve the TSP problem. Iterate through all permutations of city paths, calculate the total distance for each path, and keep track of the minimum distance and corresponding path.

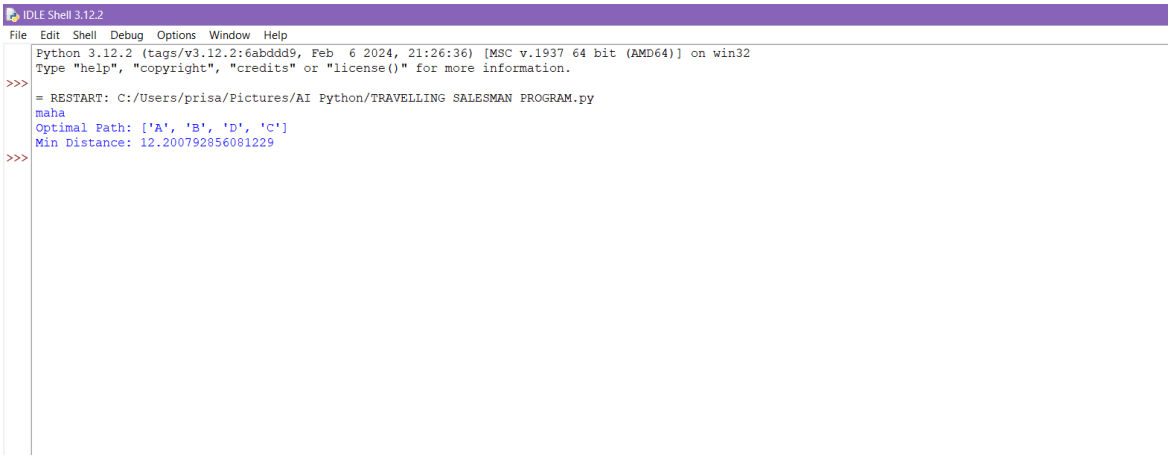
5. **Main Program:** In the main section of the program, provide an example set of cities. Call the traveling_salesman_brute_force function with the list of cities to find the optimal path and minimum distance. Finally, print the optimal path and minimum distance**.**

CODING:

```
import itertools


def calculate_distance(city1, city2):     return ((city1[0] -
city2[0])**2 + (city1[1] - city2[1])**2) ** 0.5


def total_distance(path, cities):
```

```
    distance = 0     for i in
range(len(path) - 1):
        distance += calculate_distance(cities[path[i]], cities[path[i + 1]])
    distance += calculate_distance(cities[path[-1]], cities[path[0]])  # Return to start
return distance


def traveling_salesman_brute_force(cities):
    num_cities = len(cities)
min_distance = float('inf')     min_path
= []


    for path in itertools.permutations(range(num_cities)):
        distance = total_distance(path, cities)
if distance < min_distance:
min_distance = distance             min_path
= path


    return min_path, min_distance


# Example usage:
if __name__ == "__main__":
    cities = [(0, 0), (1, 2), (3, 1), (5, 3)]     optimal_path, min_distance =
traveling_salesman_brute_force(cities)     print("Optimal path:",
optimal_path)     print("Minimum distance:", min_distance)
```

OUTPUT:



RESULT:

Hence the program been successfully executed and verified.