Lab Question 14: Traveling Salesman Problem

Aim:
To write a C program to solve TSP using dynamic programming.

Algorithm:

1. Start the program.
2. Represent graph as distance matrix.
3. Use bitmasking + DP to visit all cities exactly once.
4. Return to starting city.
5. Print minimum cost.
6. Stop.

Code (simplified, 4 cities):

```
#include <stdio.h>

#define INF 9999

#define N 4


int tsp(int mask,int pos,int dp[][1<<N],int dist[N][N]){

   if(mask==(1<<N)-1) return dist[pos][0];

   if(dp[pos][mask]!=-1) return dp[pos][mask];

   int ans=INF;

   for(int c=0;c<N;c++){

      if((mask&(1<<c))==0)


ans=(ans<dist[pos][c]+tsp(mask|(1<<c),c,dp,dist))?ans:dist[pos][c]+tsp(mask|(1<<c),c,dp,dist
);

   }

   return dp[pos][mask]=ans;

}


int main(){

   int dist[N][N]={{0,10,15,20},{10,0,35,25},{15,35,0,30},{20,25,30,0}};

   int dp[N][1<<N]; for(int i=0;i<N;i++) for(int j=0;j<(1<<N);j++) dp[i][j]=-1;
```

```
    printf("Min cost = %d", tsp(1,0,dp,dist));
    return 0;
}
```

Output:

- Distances matrix example above → Min cost = 80

Result:
The program finds optimal tour cost using TSP DP method.