

ASSIGNMENT-10

TITLE : TSP USING DP

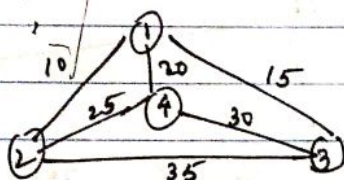
PROBLEM STATEMENT : Implement TSP using DP.

THEORY:

TSP:

Given a set of cities & distance b/w every pair of cities, the problem is to find shortest possible route that visits every city exactly once & returns to starting point.

ex1



The TSP tour in above graph is 1-2-4-3-1. The cost is 80. TSP is a famous NP-hard problem.

DYNAMIC PROGRAMMING :

Dynamic programming is mainly an optimization over plain recursion. Whenever we see a recursive solution that has repeated calls for same inputs, we can optimize it using DP. The idea is to simply store the results of sub-problems, so that we do not have to re-compute them when needed later.

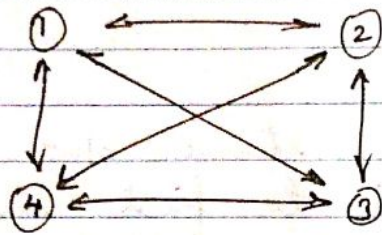
ALGORITHM:

We divide main problem into multiple sub-problems by constructing recursive tree & obtaining solutions of these sub-problems to use them to solve the main problem collectively.

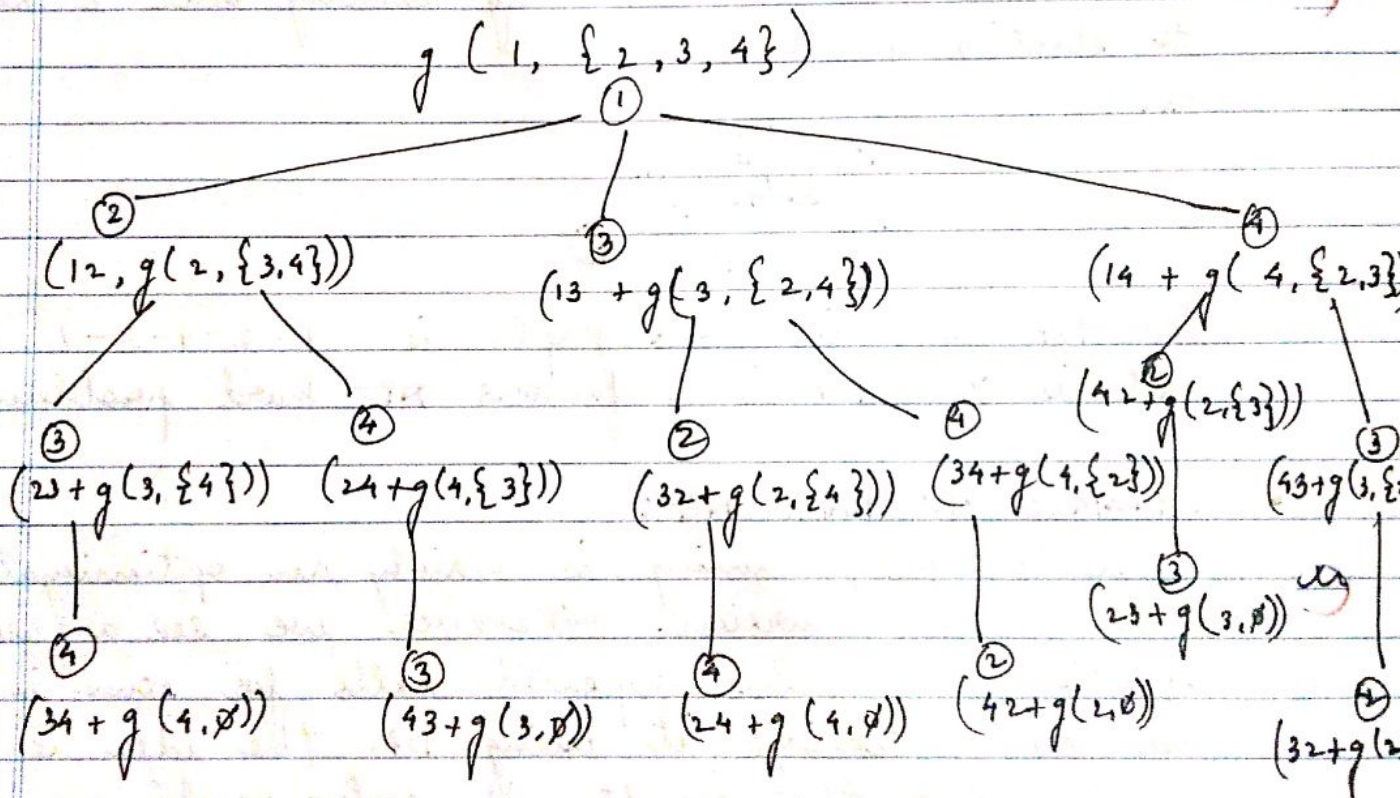
Recursive formula used for TSP:

$$g(i, s) = \min_{k \in s} \{ C_{ik} + g(k, s - \{k\}) \}$$

ex:



	1	2	3	4
1	0	10	15	20
2	5	0	9	10
3	6	13	0	12
4	8	8	9	0



$$g(2, \emptyset) = 5$$

$$g(3, \emptyset) = 6$$

$$g(4, \emptyset) = 8$$

$$g(2, \{3\}) = 15$$

$$g(2, \{4\}) = 18$$

$$g(3, \{2\}) = 18$$

$$g(3, \{4\}) = 20$$

$$g(4, \{2\}) = 13$$

$$g(4, \{3\}) = 15$$

