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| **EX.NO:3** | **WATERJUG PROGRAMUSING DFS** |
| **DATE:13.03.2024** |

**PROBLEM STATEMENT:**

Youaregiventhe2 jugs,A4-gallonjugand3-gallonjug neitherhasanymeasuring markerson it. There is a pump that can be used to fillthe jug with water how can you get two gallons

of water into the 4-gallon jug.

**AIM:**

To solve the Water jug Problem using Depth First Search.

**ALGORITHM:**

Step 1: Initialize an empty queue Q to store nodes to be visited.

Step 2: Add the starting node s to the queue Q.

Step 3: Mark node s as visited to avoid revisiting it.

Step 4: Dequeue a node u from Q

Step 5: Remove the front node u from the queue Q. b. Process

Step 6: Perform any necessary processing on node u, such as printing its value or updating a Step 7: Enqueue all unvisited neighbors of u

Step 8: For each neighbor v of u that has not been visited, add it to the queue Q and mark it as visited.

Step 9: Repeat step 4 until the queue Q is empty.

**PROGRAM:**

from collections import deque

def DFS(a, b, target):

m = {}

isSolvable = False

path = []

q = deque()

q.append((0, 0))

while len(q) > 0:

u = q.popleft()

if (u[0], u[1]) in m:

continue

if u[0] > a or u[1] > b or u[0] < 0 or u[1] < 0:

continue

path.append([u[0], u[1]])

m[(u[0], u[1])] = 1

if u[0] == target or u[1] == target:

isSolvable = True

if u[0] == target:

if u[1] != 0:

path.append([u[0], 0])

else:

if u[0] != 0:

path.append([0, u[1]])

q.append([u[0], b])

q.append([a, u[1]])

for ap in range(max(a, b) + 1):

c = u[0] + ap

d = u[1] - ap

if c == a or (d == 0 and d >= 0):

q.append([c, d])

c = u[0] - ap

d = u[1] + ap

if (c == 0 and c >= 0) or d == b:

q.append([c, d])

q.append([a, 0])

q.append([0, b])

if not isSolvable:

print("No solution")

else:

for i in range(len(path)):

print("(", path[i][0], ",", path[i][1], ")")

Jug1, Jug2, target = 4, 3, 2

print("Path from initial state to solution state:")

DFS(Jug1, Jug2, target)

**OUTPUT:**

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**RESULT:**

Thus, solving the Water jug Problem using Depth First Search has been executed successfully.