Assignment 1(A)

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DOP Doc Marks Sign

Q2. Consider following instance of 8 Puzzle Problem:

8	7	6
2	1	5
3	4	-

Initial Configuration

-	8	7
2	1	6
3	4	5

Goal Configuration

Consider Heuristic Functions defined below:
h1: misplaced tiles count except space
h2: Correctly Placed tiles Count except space
h3: Sum of Manhattan distance b/w current and correct position of all times except space.
Answer Following Questions:

a. In 8 Puzzle Problem we are concerned with getting to goal Configuration within least no. of steps. All moves are thus equally costly. Define g(n) in your own words. What will be the cost of 6 step solution to some arbitrary 8 puzzle instance?

→ The lowest path cost g(n) can be the cost to reach the goal configuration in least steps. In our case, we can reach the final configuration in atleast 4 moves: UP, UP, LEFT, LEFT. Since all the moves are equally costly, we compute g(n) as

$$g(n) = 1+1+1+1$$
$$g(n) = 4$$

Consider the following arbitrary 8 puzzle instance which gives solution in 6 steps:

8	7	6
2	1	5
_	3	4

The solution can be represented as:

{(8,7,6), (2,1,5), (_,3,4)} → {(8,7,6), (2,1,5), (3,_,4)} →

{(8,7,6), (2,1,5), (3,4,_)} → {(8,7,6), (2,1,_), (3,4,5)} →

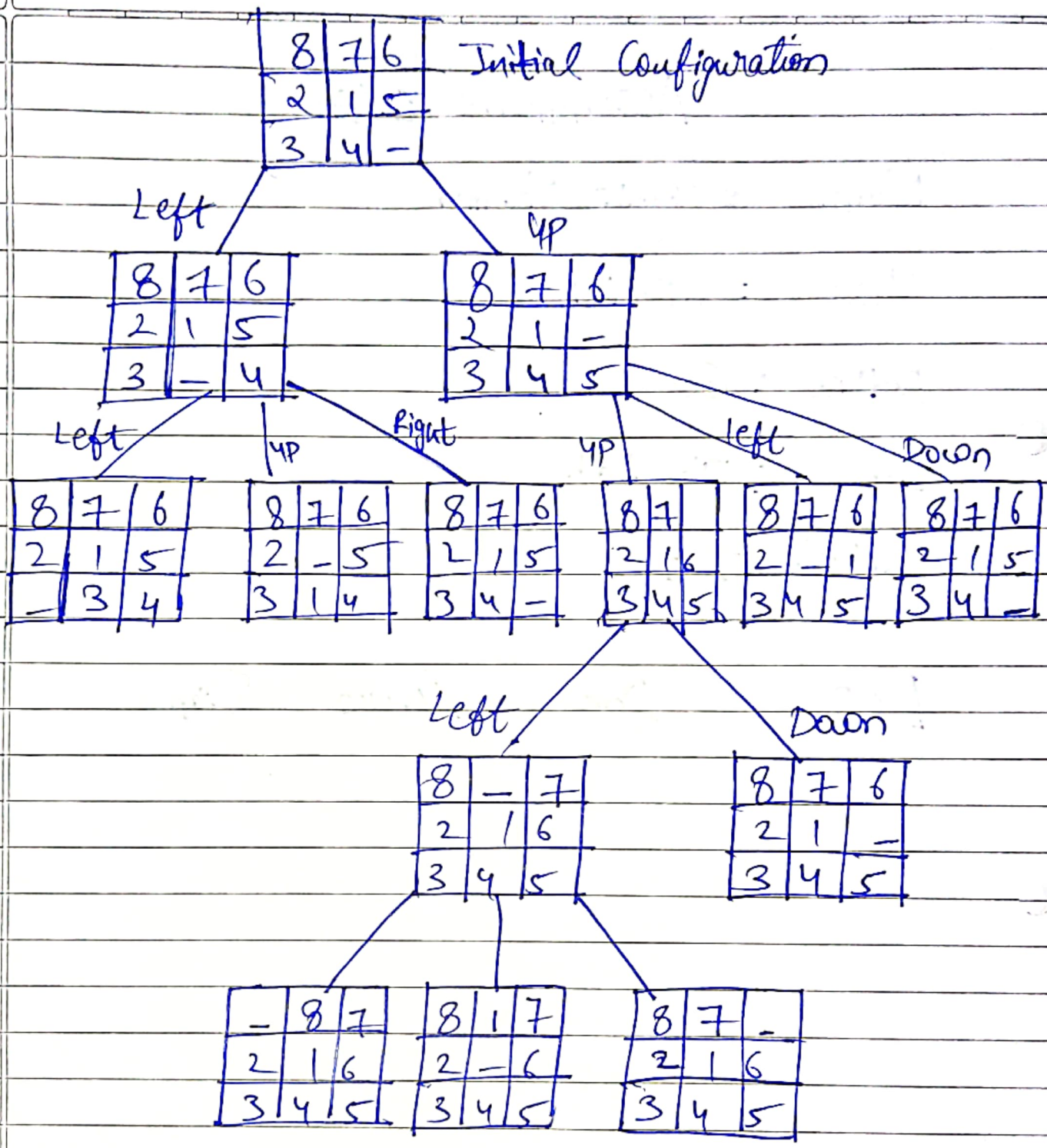
{(8,7,_), (2,1,6), (3,4,5)} → {(8,_,7), (2,1,6), (3,4,5)} →

{(_,8,7), (2,1,6), (3,4,5)}

Since all the moves are equally costly, the cost would be

$$g(n) = 6$$

C. Draw exhaustive State Space tree of depth limited to 4 for instance of 8 Puzzle Problem in the question.



e. Compute $h_i(n)$ where $i = 1,2,3$ & n = initial State, goal State from question.

→ For $i=1$, n = initial State
h_1 (initial) = Misplaced tiles count except Space
h_1 (initial) = 4

n = goal State
h_1 (goal) = 0

For $i=2$, n = initial State
h_2 (initial) = Correctly placed tiles count except Space
h_2 (initial) = 4
for n = goal State
h_2 (goal) = 8

For $i=3$, n = initial State
h_3 (initial) = Sum of Manhattan distance b/w current & correct position of all times except Space
h_3 (initial) = 0+0+0+0 + 1+1+1+1
= 4

For n = goal State
h_3 (goal) = 0