K.G.C.E.
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Assignment 1A

Page No. :
Date :

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Sub : AI

Q 2. Consider following instance of 8 puzzles problem

8	7	6
2	1	5
3	4	-

Initial

-	8	7
2	1	6
3	4	5

final configuration

Consider Heristic functions defined below:

h_1 = Misplaced tiles count except space.

h_2 = Correctly placed tiles count except space.

h_3 = sum of Manhittan distance between current and correct portim of the all tiles except space.

Answer the following question.

(a) In 8 puzzle problems we are concerned with getting to goal configuration within least number of steps. All moves are thus equally costly. Define g(n) in your own words what tells be the cost of 6 step solution to some arbitrary 8 puzzle instance?

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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 at least 4 moves ; UP, UP, LEFT, LEFT. Since all the moves ~~are~~ equally costly, we complete g(n) as

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

Consider the following orbiting 8 puzzle - Instance with gives solution in 6 steps :

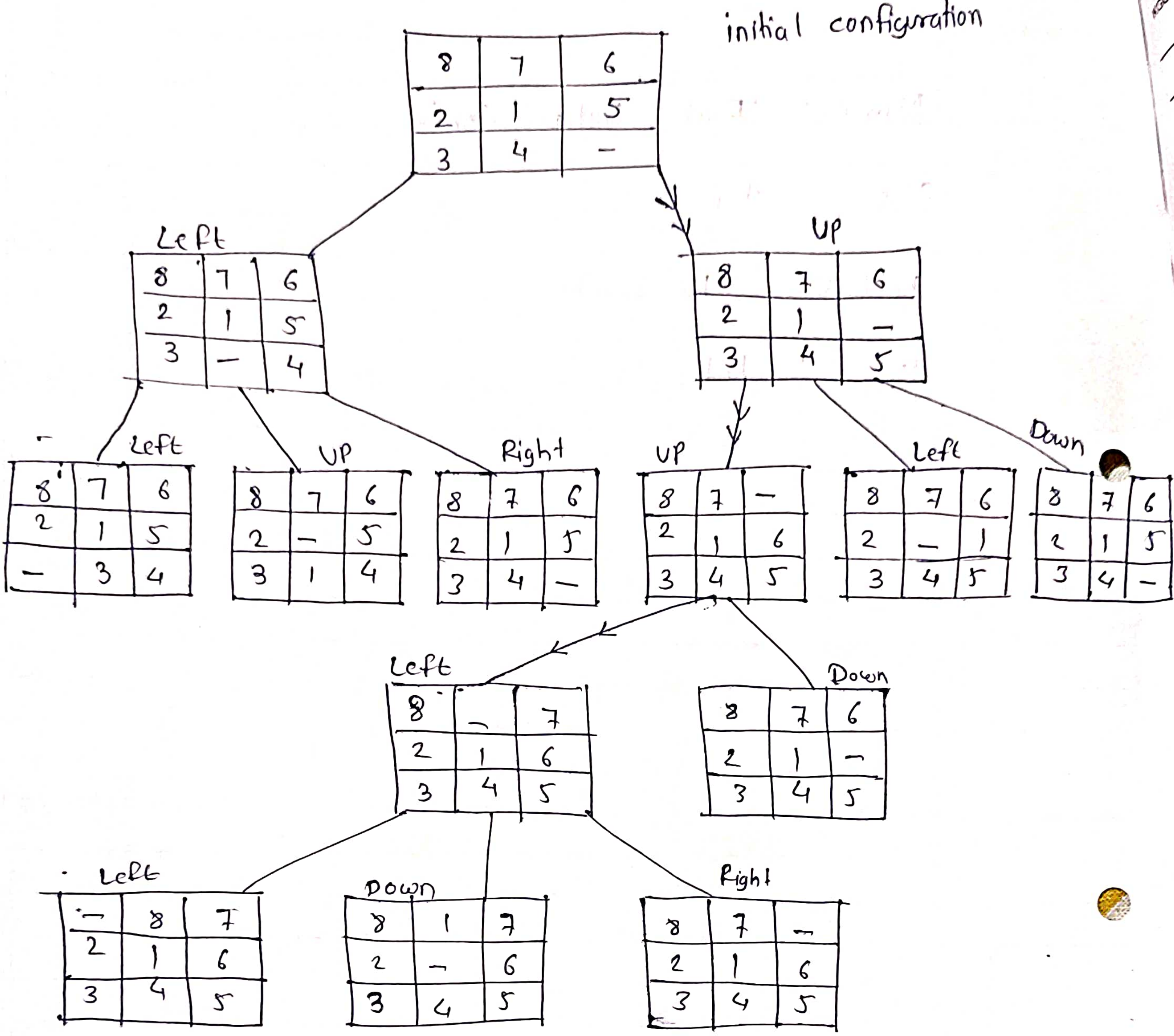
8	7	6
2	1	5
–	3	4

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.

Ans C



Final configuration.

Q Compute hi(n) where i = 1, 2, 3 and n = initial state, final / goal state from question.

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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 Mahattan distance between current and correct position of all tiles except space
h_3 (inital = 0 + 0 + 0 + 0 + 1 + 1 + 1 + 1
= 4
for n = goal state
h_3 (goal) = 0