ASSIGNMENT 1A

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CLASS: B.E.

~~BATCH~~: ROLL NO: 49

SUBJECT: AI

DOP	DOC	MARKS	SIGN

ASSIGNMENT 1A

Q.2) Consider following instance of 8 puzzle problem:

8	7	6		_	8	7
2	1	5		2	1	6
3	4	_		3	4	5

Initial Final configuration

Consider Heuristic functions defined below:
h1 = Misplaced tiles count except space
h2 = Correctly placed tiles count except space
h3 = sum of Manhattan distance between current and correct position of all tiles except space.

Answer the following questions:

(a) In 8-puzzle problem 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 will be the cost of 6 step solution to some arbitrary 8-puzzle instance?

Ans:

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 ~~min~~ at least 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

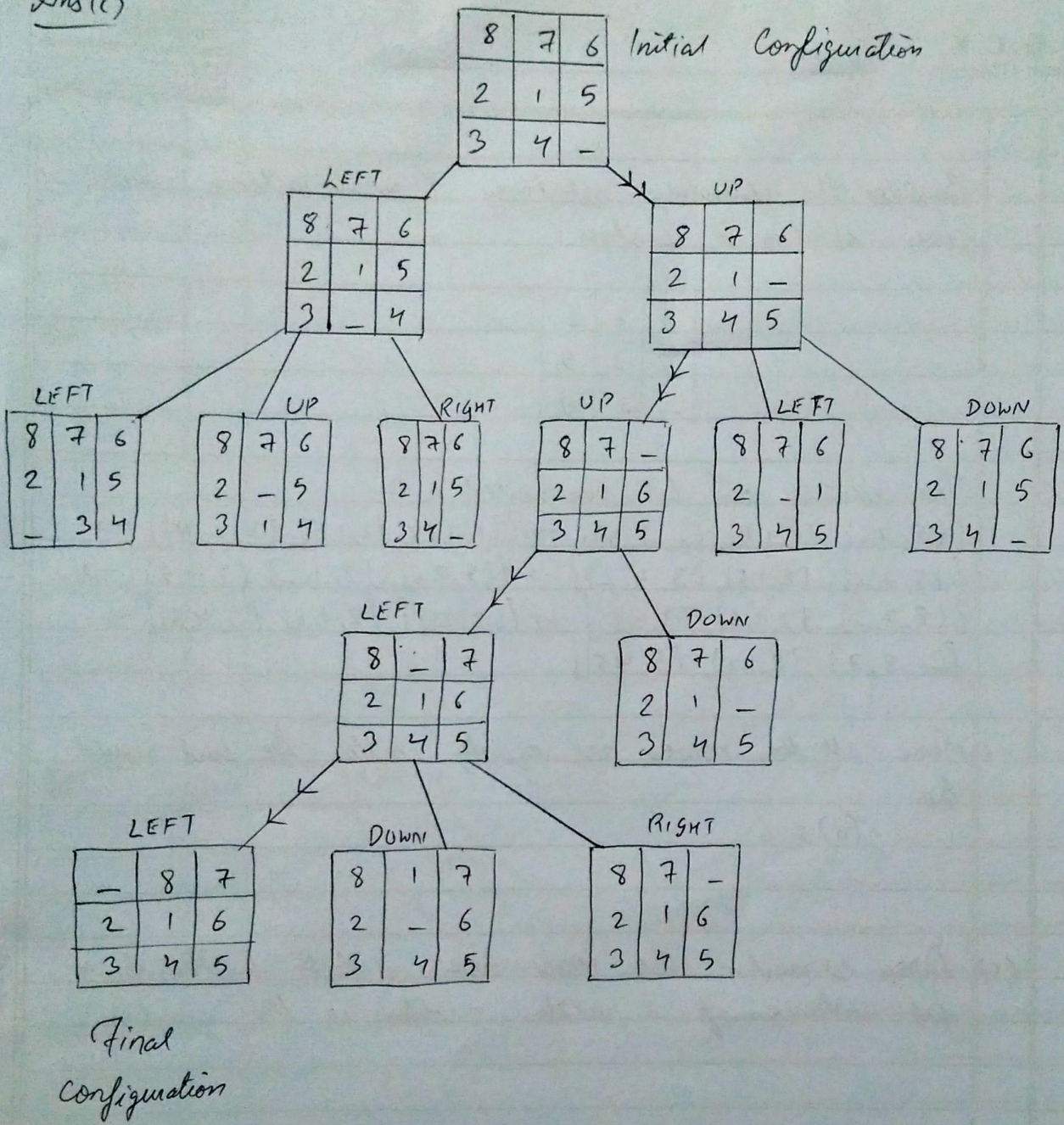
The solution can be represented as:
{{8,7,6}, {2,1,5}, {–,3,4}} → {{8,7,6}, {2,1,5}, {3,–,4}} →
{{8,7,6}, {2,1,5}, {3,4,–}} → {{8,7,6}, {2,1,–}, {3,4,5}} →
{{8,7,–}, {2,1,6}, {3,4,5}} → {{8,–,7}, {2,1,6}, {3,4,5}} →
{{–,8,7}, {2,1,6}, {3,4,5}}

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.

Ans (c)


Initial Configuration
LEFT
UP
LEFT
UP
RIGHT
UP
LEFT
DOWN
LEFT
DOWN
LEFT
DOWN
RIGHT
Final Configuration

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

Ans:

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 between current and correct position of all tiles except space

h_3(initial) = 0 + 0 + 0 + 0 + 1 + 1 + 1 + 1

= 4

For n = goal state

h_3(goal) = 0