):1
):0

Using BFS solve 8 puzzle without heuristic

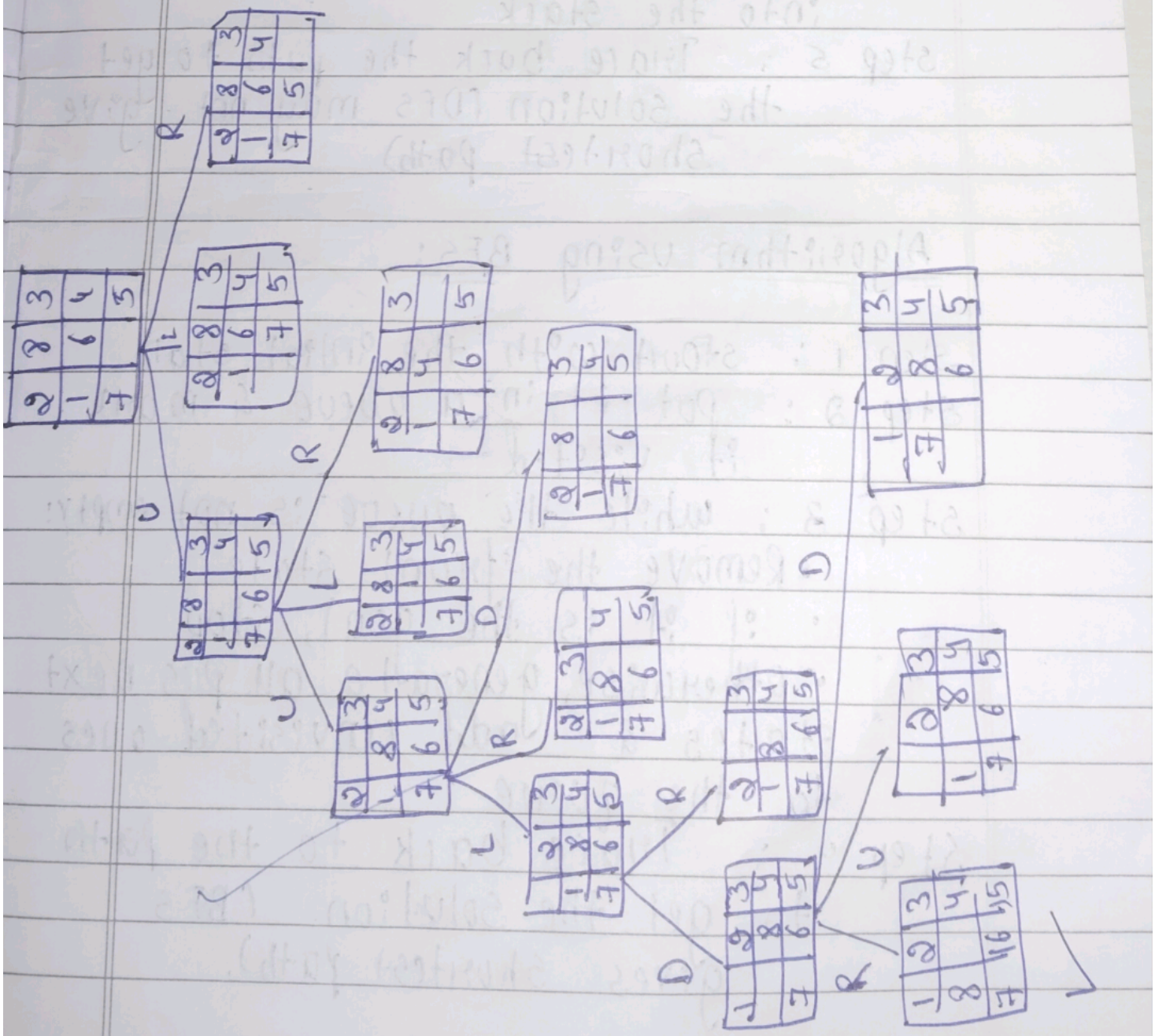
initial

2	8	3
1	6	4
7		5

goal

1	2	3
8		4
7	6	5

direction:
up, up, left, down, Right.



Algorithm using DFS:

Step 1 : start with the intial state of the puzzle
Step 2 : check if the puzzle is solvable by counting inversions. if not stop
Step 3 : push it into a stack & mark it visited
Step 4 : while the stack is not empty:
- pop the top state
- if it is the goal, stop
- otherwise, generate all pos next states & push unvisited ones into the stack

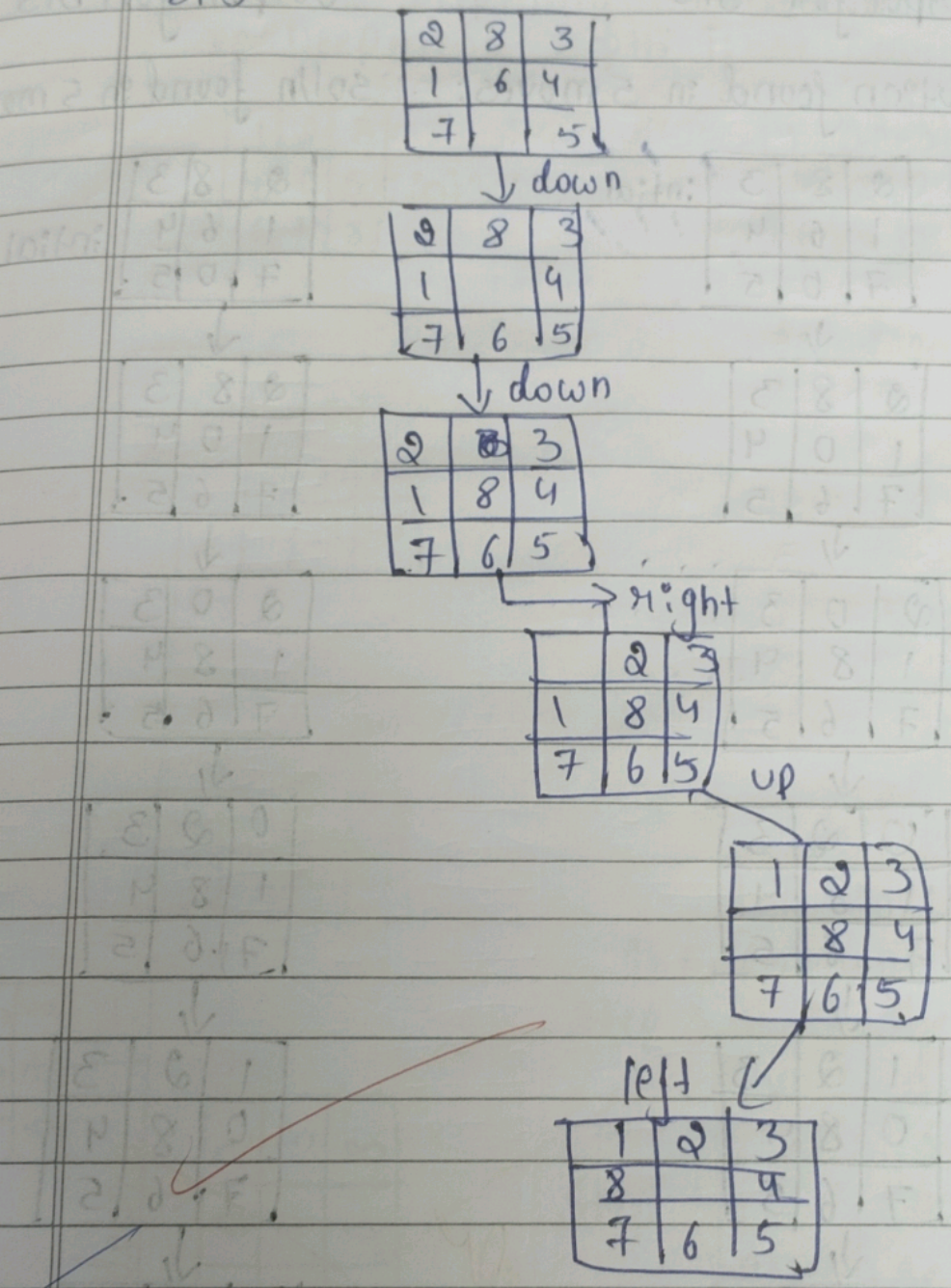
Step 5 : Trace back the path to get the solution (DFS may not give shortest path)

Algorithm using BFS:

Step 1 : start with the intial state
Step 2 : put it in a queue & mark it visited
Step 3 : while the queue is not empty:
- Remove the front state
- if it is the goal, stop.
- otherwise, generate all pos next states & add unvisited ones to the queue

Step 4 : Trace back to the path to get the solution. (BFS gives shortest path).

DFS



Page No:
Date:

output for BFS

solution found in 5 moves:

2	8	3
1	6	4
7	0	5

initial

↓

2	8	3
1	0	4
7	6	5

↓

2	0	3
1	8	4
7	6	5

↓

0	2	3
1	8	4
7	6	5

↓

1	2	3
0	8	4
7	6	5

↓

1	2	3
8	0	4
7	6	5

goal

output for DFS

soln found in 5 moves

2	8	3
1	6	4
7	0	5

initial

↓

2	8	3
1	0	4
7	6	5

↓

2	0	3
1	8	4
7	6	5

↓

0	2	3
1	8	4
7	6	5

↓

1	2	3
0	8	4
7	6	5

↓

1	2	3
8	0	4
7	6	5

goal.

Page No:
Date:

Iterative Deepening Search (IDS) or Iterative Deepening Depth first Search (IDDFS)

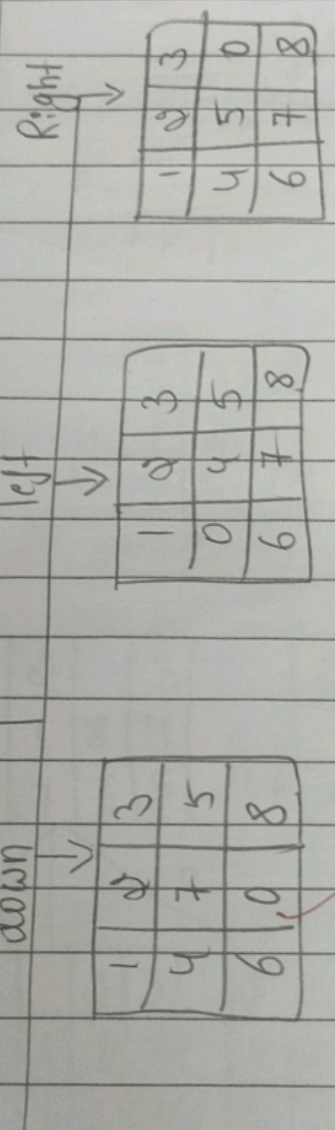
1	2	3
4	0	5
6	7	8

intial

1	2	3
4	5	0
6	7	8

goal

sol'n found in depth 1



Algorithm :

step 1 : Set depth limit = 0

step 2 : Perform Depth-limited DFS from the intial state up to the current depth limit

step 3 : if the goal is found during the path DLS, stop & return the

step 4 : if not found, increase the depth limit by 1

step 5 : Repeat steps 2-4 until the goal is found or max depth is reached.

Output:

searching with depth limit = 0
searching with depth limit = 1
Solution found in 1 moves
step 0:
1 2 3
4 0 5
6 7 8

step 1:
1 2 3
4 5 0
6 7 8

```
(2, 8, 3)
(1, 6, 4)
(7, 0, 5)
------
(2, 8, 3)
(1, 0, 4)
(7, 6, 5)
------
(2, 0, 3)
(1, 8, 4)
(7, 6, 5)
------
(0, 2, 3)
(1, 8, 4)
(7, 6, 5)
------
(1, 2, 3)
(0, 8, 4)
(7, 6, 5)
------
(1, 2, 3)
(8, 0, 4)
(7, 6, 5)
------
```

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```
Solution path:
(2, 8, 3)
(1, 6, 4)
(7, 0, 5)
------
(2, 8, 3)
(1, 0, 4)
(7, 6, 5)
------
(2, 0, 3)
(1, 8, 4)
(7, 6, 5)
------
(0, 2, 3)
(1, 8, 4)
(7, 6, 5)
------
(1, 2, 3)
(0, 8, 4)
(7, 6, 5)
------
(1, 2, 3)
(8, 0, 4)
(7, 6, 5)
------
```

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```
Searching with depth limit = 0
Searching with depth limit = 1
Solution found in 1 moves!
Step 0:
1 2 3
4 0 5
6 7 8

Step 1:
1 2 3
4 5 0
6 7 8
```

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