LAB-3A

BFS WITHOUT HEURISTIC APPROACH

CODE:-

```
from collections import deque


def print_state(state):
    for row in state:
        print(' '.join(str(x) for x in row))
    print()


def is_goal(state, goal_state):
    return state == goal_state


def find_zero(state):
    for i in range(3):
        for j in range(3):
            if state[i][j] == 0:
                return i, j


def get_neighbors(state):
    neighbors = []
    x, y = find_zero(state)
    directions = [(1,0), (-1,0), (0,1), (0,-1)]
    for dx, dy in directions:
        new_x, new_y = x + dx, y + dy
```

```
        if 0 <= new_x < 3 and 0 <= new_y < 3:
            new_state = [row[:] for row in state]
            new_state[x][y], new_state[new_x][new_y] =
new_state[new_x][new_y], new_state[x][y]
            neighbors.append(new_state)
    return neighbors

def bfs(start_state, goal_state):
    queue = deque()
    queue.append((start_state, [start_state]))
    visited = set()
    visited.add(tuple(tuple(row) for row in start_state))

    while queue:
        current_state, path = queue.popleft()

        if is_goal(current_state, goal_state):
            return path

        for neighbor in get_neighbors(current_state):
            neighbor_tuple = tuple(tuple(row) for row in neighbor)
            if neighbor_tuple not in visited:
                visited.add(neighbor_tuple)
                queue.append((neighbor, path + [neighbor]))
    return None

def read_state(name):
```

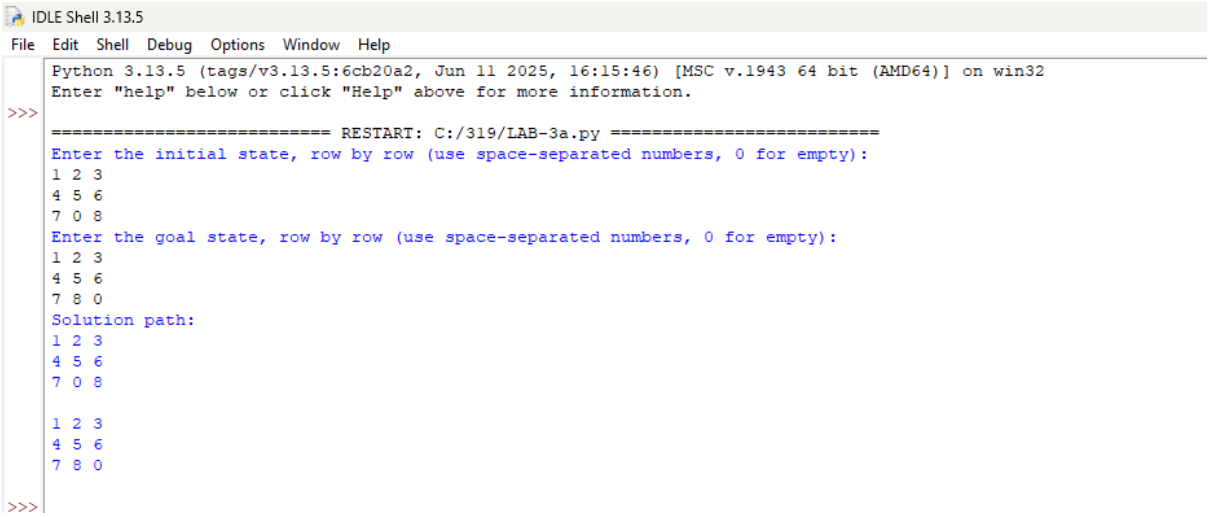
```
    print(f"Enter the {name} state, row by row (use space-separated numbers, 0 for empty):")
    state = []
    for _ in range(3):
        row = input().strip().split()
        if len(row) != 3:
            raise ValueError("Each row must have exactly 3 numbers.")
        row = list(map(int, row))
        state.append(row)
    return state

initial_state = read_state("initial")
goal_state = read_state("goal")

solution_path = bfs(initial_state, goal_state)

if solution_path:
    print("Solution path:")
    for state in solution_path:
        print_state(state)
else:
    print("No solution found")
```

OUTPUT:-


IDLE Shell 3.13.5
File Edit Shell Debug Options Window Help
Python 3.13.5 (tags/v3.13.5:6cb20a2, Jun 11 2025, 16:15:46) [MSC v.1943 64 bit (AMD64)] on win32
Enter "help" below or click "Help" above for more information.
>>>
========== RESTART: C:/319/LAB-3a.py ==========
Enter the initial state, row by row (use space-separated numbers, 0 for empty):
1 2 3
4 5 6
7 0 8
Enter the goal state, row by row (use space-separated numbers, 0 for empty):
1 2 3
4 5 6
7 8 0
Solution path:
1 2 3
4 5 6
7 0 8
1 2 3
4 5 6
7 8 0
>>>