PROGRAM TITLE -2

8-QUEEN PROBLEM

AIM:

To write and execute the python program for solving 8-Queen problem.

PROCEDURE:

1. **Board Representation**:
    - Define a 2D array or a suitable data structure to represent the chessboard.
2. **Constraint Definition**:
    - Clearly define constraints to ensure that no two queens threaten each other. This includes checking for conflicts in rows, columns, and diagonals.
3. **Backtracking Algorithm**:
    - Implement a recursive backtracking algorithm to explore all possible queen placements on the board. Start with the first row and try placing queens in each column.
4. **Constraint Checking:**
    - At each step, check whether placing a queen in the current position violates any constraints. If a conflict is detected, backtrack to the previous state and try a different position.
5. **Base Case and Solution Printing**:
    - Define a base case that stops the recursion when a valid solution is found or when all possibilities are explored. Print or store the solutions accordingly.

CODING:

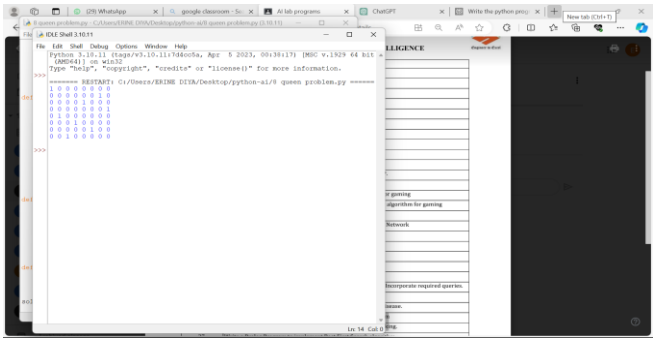
```
def is_goal(state):
  return state == [[1, 2, 3], [4, 5, 6], [7, 8, 0]]


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

```
def get_valid_moves(state, empty_pos):
  moves = []
  i, j = empty_pos
  if i > 0:
    moves.append("up")
  if i < 2:
    moves.append("down")
  if j > 0:
    moves.append("left")
  if j < 2:
    moves.append("right")
  return moves

def solve(state, visited):

  if is_goal(state):
    return state
  visited.add(tuple(map(tuple, state)))

  empty_pos = find_empty(state)
  for move in get_valid_moves(state, empty_pos):
    new_state = [row.copy() for row in state]
    i, j = empty_pos
    if move == "up":
      new_state[i][j], new_state[i - 1][j] = new_state[i - 1][j], new_state[i][j]
    elif move == "down":
      new_state[i][j], new_state[i + 1][j] = new_state[i + 1][j], new_state[i][j]
    elif move == "left":
```

```
      new_state[i][j], new_state[i][j - 1] = new_state[i][j - 1], new_state[i][j]
    else:
      new_state[i][j], new_state[i][j + 1] = new_state[i][j + 1], new_state[i][j]

    if tuple(map(tuple, new_state)) not in visited:
      solution = solve(new_state, visited.copy())
      if solution:
        return [move] + solution
  return None

initial_state = [[1, 2, 3], [0, 4, 6], [7, 5, 8]]
visited = set()
solution = solve(initial_state, visited)

if solution:
  print("Solution found!")
  for move in solution:
    print(move)
else:
  print("No solution found.")
N = 8

def solveNQueens(board, col):
        if col == N:
                print(board)
                return True
        for i in range(N):
                if isSafe(board, i, col):
                        board[i][col] = 1
```

```
                if solveNQueens(board, col + 1):
                    return True
                board[i][col] = 0
        return False

def isSafe(board, row, col):
        for x in range(col):
            if board[row][x] == 1:
                return False
        for x, y in zip(range(row, -1, -1), range(col, -1, -1)):
            if board[x][y] == 1:
                return False
        for x, y in zip(range(row, N, 1), range(col, -1, -1)):
            if board[x][y] == 1:
                return False
        return True

board = [[0 for x in range(N)] for y in range(N)]
if not solveNQueens(board, 0):
        print("No solution found")
```

OUTPUT:



RESULT:

Thus the program has been successfully executed and verified.