Experiment No.:-5

Design n-Queens matrix having first Queen placed. Use backtracking to place remaining Queens to generate the final n-queen’s matrix.

Source Code:-

In [1]:

**class** Queen:

**def** init (self, N): self**.**N **=** N

self**.**board **=** [[0]**\***N **for** \_ **in** range(N)]

**def** disp\_board(self):

**for** row **in** self**.**board: print()

**for** col **in** row:

**if** col **==** 1:

print(u"\U0001F451", end**=**' ') *# Queen emoji*

**else**:

print(u"\u274C", end**=**' ') *# Cross mark emoji*

print(end**=**'\n')

**def** is\_attack(self, i, j):

**for** k **in** range(0, self**.**N):

**if** self**.**board[i][k] **==** 1 **or** self**.**board[k][j] **==** 1:

**return True**

**for** k **in** range(0, self**.**N):

**for** l **in** range(0, self**.**N):

**if** (k **+** l **==** i **+** j) **or** (k **-** l **==** i **-** j):

**if** self**.**board[k][l] **==** 1:

**return True**

**return False**

**def** N\_queen(self, n):

**if** n **==** 0:

**return True**

**for** i **in** range(0, self**.**N):

**for** j **in** range(0, self**.**N):

**if** (**not** self**.**is\_attack(i, j)) **and** (self**.**board[i][j] **!=** 1): self**.**board[i][j] **=** 1

**if** self**.**N\_queen(n**-**1):

**return True**

self**.**board[i][j] **=** 0

**return False**

**def** queen\_positions(self): positions **=** []

**for** i **in** range(self**.**N):

**for** j **in** range(self**.**N):

**if** self**.**board[i][j] **==** 1: positions**.**append((i, j))

**return** positions

*# Input number of queens*

N **=** int(input("Enter the number of queens: ")) Q **=** Queen(N)

print('Initial State:') Q**.**disp\_board()

Q**.**N\_queen(N)

print('\nFinal State:') Q**.**disp\_board()

positions **=** Q**.**queen\_positions() print('\nPositions of the queens:') **for** idx, pos **in** enumerate(positions):

print(f"Queen {idx **+** 1}: Row {pos[0] **+** 1}, Column {pos[1] **+** 1}")

Enter the number of queens: 8 Initial State:

❌ ❌ ❌ ❌ ❌ ❌ ❌ ❌

❌ ❌ ❌ ❌ ❌ ❌ ❌ ❌

❌ ❌ ❌ ❌ ❌ ❌ ❌ ❌

❌ ❌ ❌ ❌ ❌ ❌ ❌ ❌

❌ ❌ ❌ ❌ ❌ ❌ ❌ ❌

❌ ❌ ❌ ❌ ❌ ❌ ❌ ❌

❌ ❌ ❌ ❌ ❌ ❌ ❌ ❌

❌ ❌ ❌ ❌ ❌ ❌ ❌ ❌

Final State:

:Ç.: ❌ ❌ ❌ ❌ ❌ ❌ ❌

❌ ❌ ❌ ❌ .Ç:: ❌ ❌ ❌

❌ ❌ ❌ ❌ ❌ ❌ ❌ :Ç.:

❌ ❌ ❌ ❌ ❌ :Ç.: ❌ ❌

❌ ❌ .:Ç: ❌ ❌ ❌ ❌ ❌

❌ ❌ ❌ ❌ ❌ ❌ :.:Ç ❌

❌ :.Ç: ❌ ❌ ❌ ❌ ❌ ❌

❌ ❌ ❌ :Ç.: ❌ ❌ ❌ ❌

Positions of the queens: Queen 1: Row 1, Column 1

Queen 2: Row 2, Column 5

Queen 3: Row 3, Column 8

Queen 4: Row 4, Column 6

Queen 5: Row 5, Column 3

Queen 6: Row 6, Column 7

Queen 7: Row 7, Column 2

Queen 8: Row 8, Column 4

In [ ]: