Experiment No.:-5

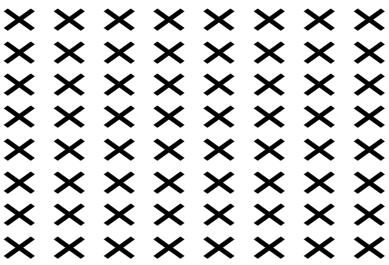
Design n-Queens matrix having first Queen placed. Use backtracking to place remaining Queens to generate the final n-queen's matrix.

Source Code:-

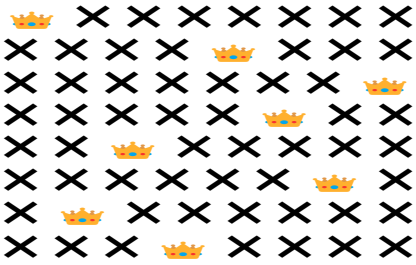
In [1]:
```
class Queen:

    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:
```



```
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 [ ]: