Ex. No: 2 4 –Queens Problem using Iterative Deepening

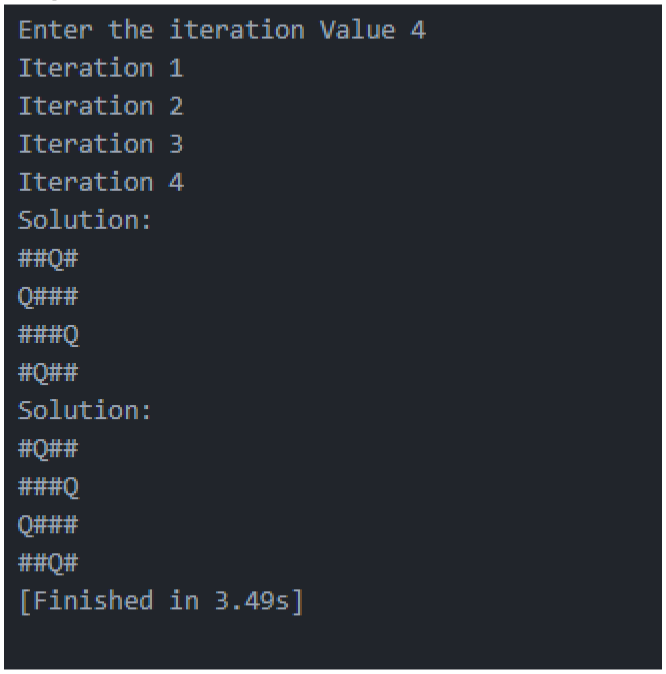
08/08/2022 and Depth Limited DFS

1)Iterative Deepening:

Code:

```
res = []
def totalNQueens(n):
    def check(x, y, board):
        i = x
        j = y
        # checking upper left diagonal
        while i >= 0 and j >= 0:
            if board[i][j] == 1:
                return False
            i -= 1
            j -= 1
        i = x
        j = y
        # checking lower left diagonal
        while i < n and j >= 0:
            if board[i][j] == 1:
                return False
            i += 1
            j -= 1
        i = x
        j = y
        # checking the column
        while j >= 0:
            if board[i][j] == 1:
                return False
            j -= 1
        return True
    def dfs(col, board, maxdepth):
        if col >= n:
            res.append([])
            for i in range(n):
                res[-1].append("")
                for j in range(n):
                    if board[i][j]:
                        res[-1][-1] += "Q"
                    else:
                        res[-1][-1] += "#"
            return
        if maxdepth <= 0:
            return False
        for i in range(n):
            if check(i, col, board):
                board[i][col] = 1
                dfs(col+1, board, maxdepth-1)
                board[i][col] = 0
    board = [[0]*n for i in range(n)]
    print("Enter the iteration Value")
    for i in range(int(input())):
        res = []
        dfs(0, board, i+1)
        print("Iteration",i+1)
        for i in res:
            print("Solution:")
            for j in i:
                print(j)
totalNQueens(4)
```

Output:



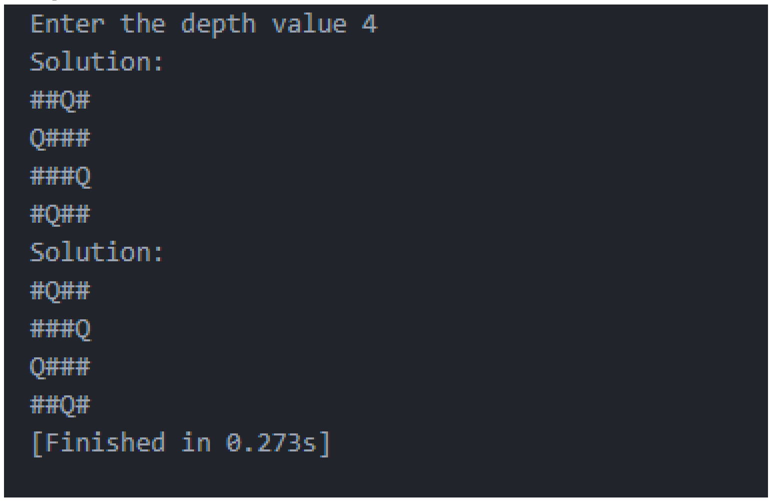
```
Enter the iteration Value 4
Iteration 1
Iteration 2
Iteration 3
Iteration 4
Solution:
##Q#
Q###
###Q
#Q##
Solution:
#Q##
###Q
Q###
##Q#
[Finished in 3.49s]
```

2)Depth Limited
Code:

```
res = []
def totalNQueens( n) -> int:
    def check(x, y, board):
        i = x
        j = y
            # checking upper left diagonal
        while i >= 0 and j >= 0:
            if board[i][j] == 1:
                return False
            i -= 1
            j -= 1
        i = x
        j = y
            # checking lower left diagonal
        while i < n and j >= 0:
            if board[i][j] == 1:
                return False
            i += 1
            j -= 1
        i = x
        j = y
        # checking the column
        while j >= 0:
            if board[i][j] == 1:
                return False
            j -= 1
        return True
    def dfs(col, board, depth):
        if col >= n:
            res.append([])
            for i in range(n):
                res[-1].append("")
                for j in range(n):
                    if board[i][j]:
                        res[-1][-1] += "Q"
                    else:
                        res[-1][-1] += "#"
            return
        if depth <= 0:
            return False
        for i in range(n):
            if check(i, col, board):
                board[i][col] = 1
                dfs(col+1, board, depth-1)
                board[i][col] = 0
    board = [ [0]*n for i in range(n) ]
    print("Enter the depth value")
    depth = int(input())
    dfs(0, board, depth)
    for i in res:
        print("Solution:")
        for j in i:
            print(j)

totalNQueens(4)
```

Output:



```
Enter the depth value 4
Solution:
##Q#
Q###
###Q
#Q##
Solution:
#Q##
###Q
Q###
##Q#
[Finished in 0.273s]
```