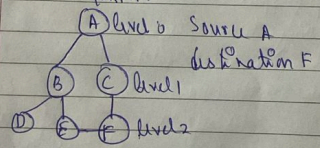
Date:8/10/24
Program Title:Implement Iterative Deepening Search Algorithm
Algorithm - (NEXT PAGE)

10/8/24 IMPLEMENT ITERATIVE DEEPENING SEARCH ALGORITHM

ALGORITHM

1) Start at the initial node
2) Initialize a variable for depth limit, starting from 0
3) Perform DFS for current depth limit
   - Explore each path from 1st node till the current depth limit
   - If the goal is found, return the path to the goal
4) If the goal is not reached, increment depth limit, repeat step3
5) Continue until goal is reached or all nodes within the graph's depth have been explored

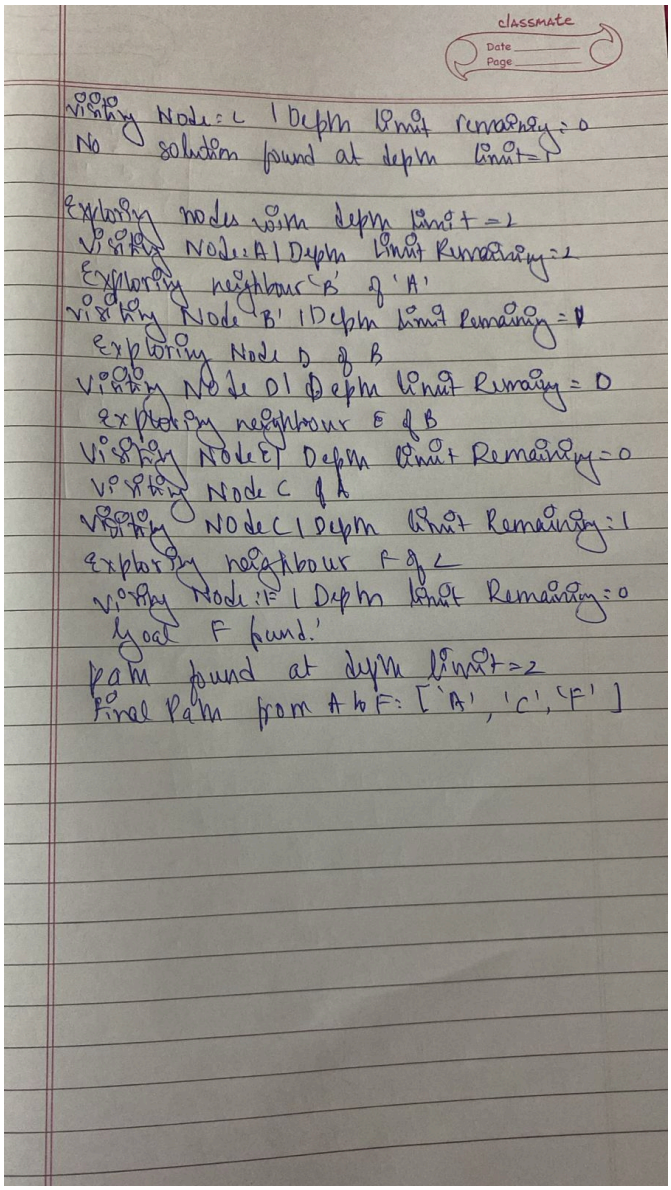
INPUT GRAPH:



OUTPUT:

Exploring Nodes with depth limit = 0
Visiting Node A | depth limit Remaining: 0
No solution found at depth limit 0

Exploring Nodes with depth limit: 1
Visiting Node A | Depth limit Remaining = 1
for Exploring Neighbour 'B' of A
Visiting Node: B | Depth limit Remaining = 0
Exploring neighbour 'E' of 'A'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Visiting Node: C | Depth limit remaining: 0
No solution found at depth limit=1
Exploring nodes with depth limit = 2
Visiting Node: A | Depth Limit Remaining: 2
Exploring neighbour 'B' of 'A'
Visiting Node 'B' | Depth limit Remaining = 1
Exploring Node D of B
Visiting Node D | Depth limit Remaing = 0
exploring neighbour E of B
Visiting Node E | Depth limit Remaing = 0
Visiting Node C of A
Visiting NOde C | Depth limit Remaing: 1
exploring neighbour F of C
Visiting Node: F | Depth limit Remaing: 0
Goal F found!
Path found at depth limit = 2
Final Path from A to F: ['A', 'C', 'F']

Code:

```python
def iterative_deepening_search(graph, start, goal):
    print(f"Starting Iterative Deepening Search from '{start}' to '{goal}'\n")
    for depth in range(len(graph)):
        print(f"Exploring nodes with depth limit = {depth}")
        result = depth_limited_search(graph, start, goal, depth)
        if result is not None:
            print(f"\nPath found at depth limit = {depth}")
            return result
        print(f"No solution found at depth limit = {depth}\n")
    return None
def depth_limited_search(graph, start, goal, depth_limit):
    print(f"Visiting Node: {start} | Depth Limit Remaining: {depth_limit}")
    if start == goal:
        print(f"Goal '{goal}' found!")
        return [start]
    if depth_limit == 0:
        return None
    for neighbor in graph.get(start, []):
        print(f"Exploring neighbor '{neighbor}' of '{start}'")
        path = depth_limited_search(graph, neighbor, goal, depth_limit - 1)
        if path:
            return [start] + path
    return None
graph = {
    'A': ['B', 'C'],
    'B': ['D', 'E'],
    'C': ['F'],
    'D': [],
    'E': ['F'],
    'F': []
}
start_node = 'A'
goal_node = 'F'
```

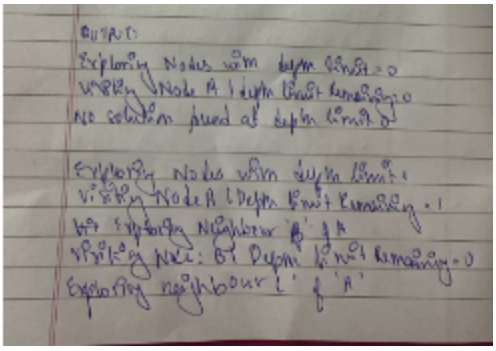
```python
path = iterative_deepening_search(graph, start_node, goal_node)
if path:
    print(f"\nFinal Path from {start_node} to {goal_node}: {path}")
else:
    print(f"\nNo path found from {start_node} to {goal_node}")
```


```
def iterative_deepening_search(graph, start, goal):
    print(f"Starting Iterative Deepening Search from '{start}' to '{goal}'\n")
    for depth in range(len(graph)):
        print(f"Exploring nodes with depth limit = {depth}")
        result = depth_limited_search(graph, start, goal, depth)
        if result is not None:
            print(f"\nPath found at depth limit = {depth}")
            return result
        print(f"No solution found at depth limit = {depth}\n")
    return None
def depth_limited_search(graph, start, goal, depth_limit):
    print(f"Visiting Node: {start} | Depth Limit Remaining: {depth_limit}")
    if start == goal:
```

```
        print(f"Goal '{goal}' found!")
        return [start]
    if depth_limit == 0:
        return None
    for neighbor in graph.get(start, []):
        print(f"Exploring neighbor '{neighbor}' of '{start}'")
        path = depth_limited_search(graph, neighbor, goal, depth_limit - 1)
        if path:
            return [start] + path
    return None
graph = {
    'A': ['B', 'C'],
    'B': ['D', 'E'],
    'C': ['F'],
    'D': [],
    'E': ['F'],
    'F': []
}
start_node = 'A'
goal_node = 'F'
path = iterative_deepening_search(graph, start_node, goal_node)
if path:
    print(f"\nFinal Path from {start_node} to {goal_node}: {path}")
else:
    print(f"\nNo path found from {start_node} to {goal_node}")
```

Output(NEXT PAGE)

```
Starting Iterative Deepening Search from 'A' to 'F'

Exploring nodes with depth limit = 0
Visiting Node: A | Depth Limit Remaining: 0
No solution found at depth limit = 0

Exploring nodes with depth limit = 1
Visiting Node: A | Depth Limit Remaining: 1
Exploring neighbor 'B' of 'A'
Visiting Node: B | Depth Limit Remaining: 0
Exploring neighbor 'C' of 'A'
Visiting Node: C | Depth Limit Remaining: 0
No solution found at depth limit = 1

Exploring nodes with depth limit = 2
Visiting Node: A | Depth Limit Remaining: 2
Exploring neighbor 'B' of 'A'
Visiting Node: B | Depth Limit Remaining: 1
Exploring neighbor 'D' of 'B'
Visiting Node: D | Depth Limit Remaining: 0
Exploring neighbor 'E' of 'B'
Visiting Node: E | Depth Limit Remaining: 0
Exploring neighbor 'C' of 'A'
Visiting Node: C | Depth Limit Remaining: 1
Exploring neighbor 'F' of 'C'
Visiting Node: F | Depth Limit Remaining: 0
Goal 'F' found!

Path found at depth limit = 2

Final Path from A to F: ['A', 'C', 'F']
```



OUTPUT:
Exploring Nodes with depth limit = 0
Visiting Node A | depth limit remaining = 0
No solution found at depth limit 0

Exploring Nodes with depth limit = 1
Visiting Node A | Depth limit remaining = 1
Exploring Neighbour 'B' of 'A'
Visiting Node: B | Depth limit remaining = 0
Exploring neighbour 'C' of 'A'

Visiting Node: A | Depth limit Remaining = 2
Exploring neighbour 'B' of 'A'
Visiting Node 'B' | Depth limit Remaining = 1
Exploring Node D of B
Visiting Node D | Depth limit Remaing = 0
Exploring neighbour E of B
Visiting Node E | Depth limit Remaing = 0
Visiting Node C of A
Visiting NODE C | Depth limit Remaing = 1
Exploring neighbour F of C
Visiting Node: F | Depth limit Remaing = 0
Goal F found!
Path found at depth limit = 2
Final Path from A to F: ['A', 'C', 'F']