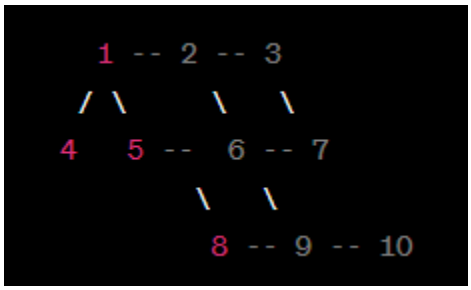
Task 1 – Breadth First Search (BFS):

(i) Create a graph with at least 10 nodes:

Let's create an example undirected graph with 10 nodes and 11 edges:



(ii) Write a program in Python to perform a Breadth First Search to find a specific node in the graph:

Python program to perform BFS on the given graph:

```
from collections import defaultdict, deque

class Graph:
        def __init__(self):
        self.graph = defaultdict(list)

        def add_edge(self, u, v):
        self.graph[u].append(v)
        self.graph[v].append(u)

        def bfs(self, start, target):
        visited = set()
        queue = deque([start])

        while queue:
        current = queue.popleft()
        if current == target:
                return True

        visited.add(current)
        for neighbor in self.graph[current]:
                if neighbor not in visited:
                queue.append(neighbor)

        return False
```

```
# Create the graph
graph = Graph()
graph.add_edge(1, 2)
graph.add_edge(1, 4)
graph.add_edge(2, 3)
graph.add_edge(2, 5)
graph.add_edge(2, 6)
graph.add_edge(3, 6)
graph.add_edge(3, 7)
graph.add_edge(5, 6)
graph.add_edge(5, 8)
graph.add_edge(6, 9)
graph.add_edge(9, 10)

# Perform BFS and search for node 10 starting from node 1
start_node = 1
target_node = 10
result = graph.bfs(start_node, target_node)

if result:
        print(f"Node {target_node} is reachable from Node {start_node} using BFS.")
else:
        print(f"Node {target_node} is NOT reachable from Node {start_node} using BFS.")
```

(iii) Description and Output:

In the given graph, each node represents a unique vertex, and each edge represents an undirected connection between two vertices. We created a graph with 10 nodes and used adjacency lists to represent the connections between the nodes.

The BFS algorithm starts from a given start node and explores its neighbors level by level. It uses a queue data structure to keep track of the nodes to be visited.

In the Python code, we perform a BFS starting from node 1 and search for node 10. The output will indicate whether node 10 is reachable from node 1 using BFS.

Task 2 – Depth First Search (DFS):

To perform DFS on the same graph, we need to modify the `Graph` class to implement the DFS algorithm.

Python code:

```
class Graph:
        def __init__(self):
```

```
        self.graph = defaultdict(list)

        def add_edge(self, u, v):
        self.graph[u].append(v)
        self.graph[v].append(u)

        def dfs(self, start, target, visited):
        if start == target:
        return True

        visited.add(start)
        for neighbor in self.graph[start]:
        if neighbor not in visited:
                if self.dfs(neighbor, target, visited):
                return True

        return False

# Create the graph (same as before)

# Perform DFS and search for node 10 starting from node 1
start_node = 1
target_node = 10
visited_nodes = set()
result = graph.dfs(start_node, target_node, visited_nodes)

if result:
        print(f"Node {target_node} is reachable from Node {start_node} using DFS.")
else:
        print(f"Node {target_node} is NOT reachable from Node {start_node} using DFS.")
```

C: > Users > Yoann > Desktop > tp4.py > ...

```python
from collections import defaultdict, deque

class Graph:
    def __init__(self):
        self.graph = defaultdict(list)

    def add_edge(self, u, v):
        self.graph[u].append(v)
        self.graph[v].append(u)

    def bfs(self, start, target):
        visited = set()
        queue = deque([start])

        while queue:
            current = queue.popleft()
            if current == target:
                return True

            visited.add(current)
            for neighbor in self.graph[current]:
                if neighbor not in visited:
                    queue.append(neighbor)

        return False
# Create the graph
graph = Graph()
graph.add_edge(1, 2)
graph.add_edge(1, 4)
graph.add_edge(2, 3)
graph.add_edge(2, 5)
graph.add_edge(2, 6)
graph.add_edge(3, 6)
graph.add_edge(3, 7)
graph.add_edge(5, 6)
graph.add_edge(5, 8)
graph.add_edge(6, 9)
graph.add_edge(9, 10)

# Perform BFS and search for node 10 starting from node 1
start_node = 1
target_node = 10
result = graph.bfs(start_node, target_node)

if result:
    print(f"Node {target_node} is reachable from Node {start_node} using BFS.")
else:
    print(f"Node {target_node} is NOT reachable from Node {start_node} using BFS.")

```

```
C:\Users\Yoann\Desktop>python tp4.py
Node 10 is reachable from Node 1 using BFS.
```