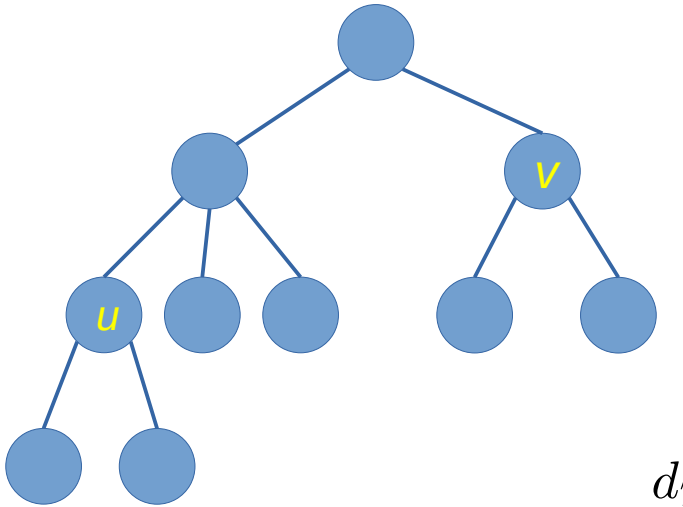
Practice Lessons

Dec. 12 2024

1). Distance in a Tree by BFS

- In this exercise, the input is a tree. The goal is to find the distance between two given nodes in the tree **by BFS or DFS**.
  - **NOTE:** Be sure to implement the BFS or DFS travel function.



$$d_T(u, v) = 3.$$

1). Distance in a Tree by BFS

- **Input:**
  - The first line denotes the root number.
    Then, from the second line to the line before the last line, each line contains two integers `x` and `y` (separated by space), which represents an edge (*x*, *y*) in the input tree.
    The last line provides the two vertices, separated by space, which represents the two vertices *u* and *v* we are asking for the distance.
- **Output:** the distance between *u* and *v* in the input tree.

Sample Input & Output

- Sample input:

```
0
0 3
0 1
1 2
1 4
1 5
3 6
3 7
3 4
```

- Sample output:

```
3
```

2). Implement the Prim's algorithm

- **Input:**
  - First line: the starting vertex;
  - Second to the last line: vertex pairs: each line contains three integers specifying two adjacent vertices and their edge weight (undirected graph).
- **Output:**
  - the edges in the minimum spanning tree of the input graph (1st line).
  - the cost of minimum spanning tree (2nd line).

Sample Input & Output

- Sample input:

```
0
0 1 4
0 7 8
1 7 11
1 2 8
2 3 7
2 5 4
2 8 2
6 7 1
6 8 6
7 8 7
3 5 14
3 4 9
4 5 10
5 6 2
```

- Sample output:

```
(0 1) (1 2) (2 3) (2 5) (2 8) (3 4) (5 6) (6 7)
37
```