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Hashing

Course on Data Structure

Pankaj Sharma • Lesson 32 • Aug 14, 2024

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CS & IT Engineering

Data Structure

Graphs

Lecture Number- 32

By- Pankaj Sir

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Topics

to be covered

1. Representation of Graphs

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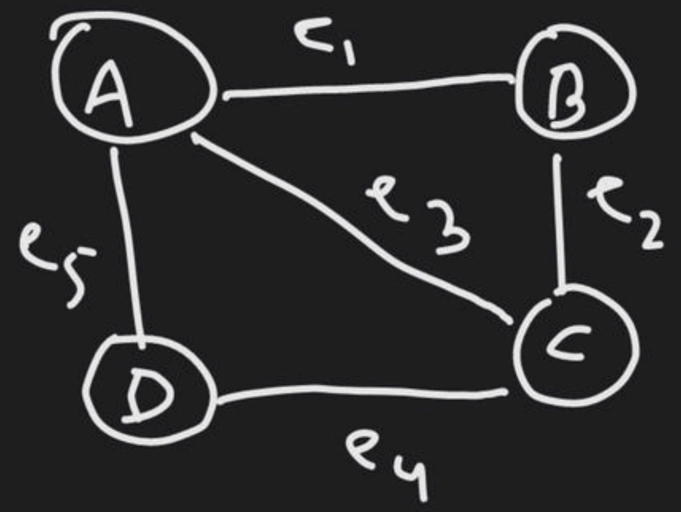
Graphs

Non linear data structure

$G(V, E)$

V → set of vertices

E → set of edges



$V = \{A, B, C, D\}$

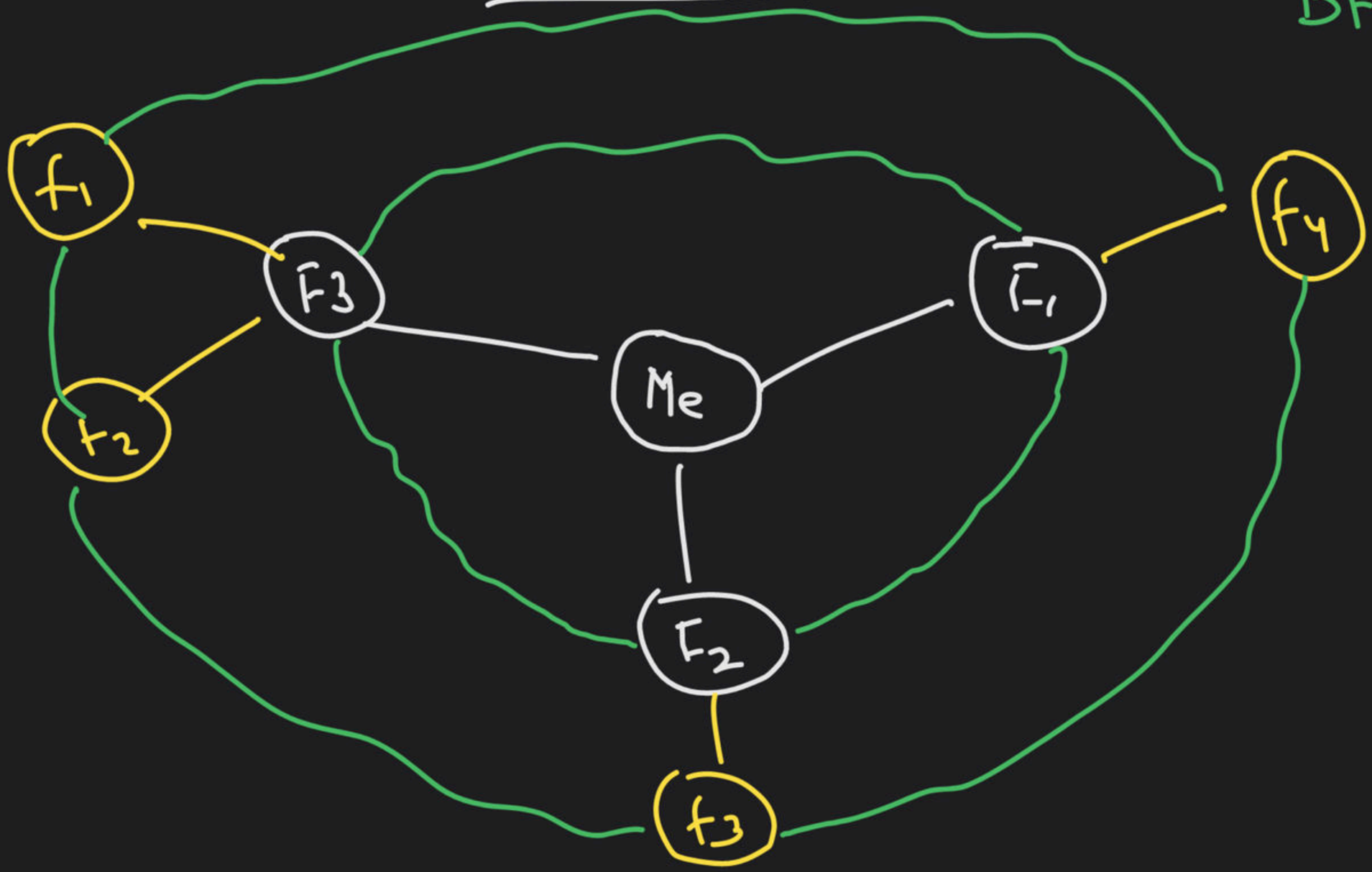
$E = \{e_1, e_2, e_3, e_4, e_5\}$

CS

WOW

Social N/w

BFS



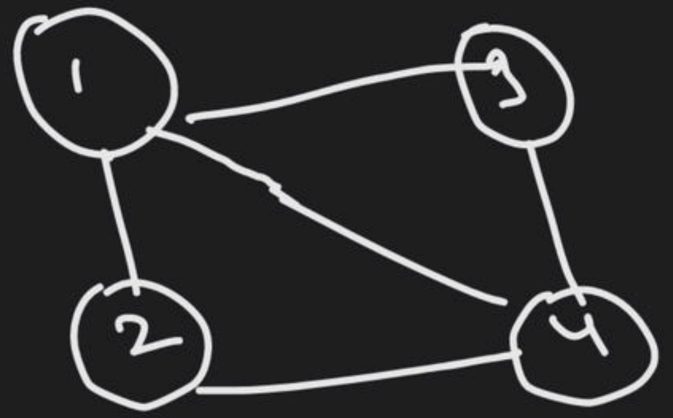
Graph Representation

1) Adjacency Matrix
2) Adjacency List

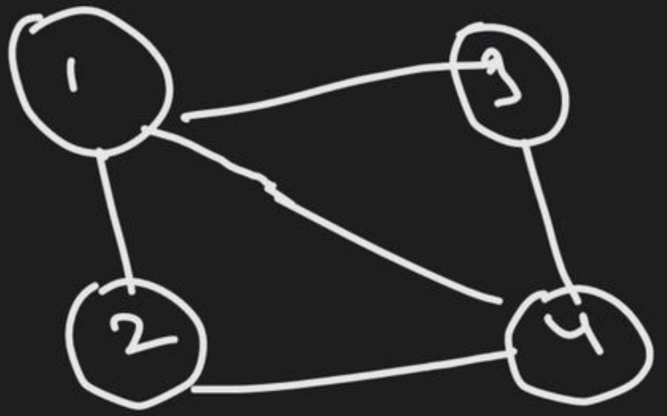
Adjacency Matrix : $n \times n$ matrix , $n \Rightarrow$ no. of vertices

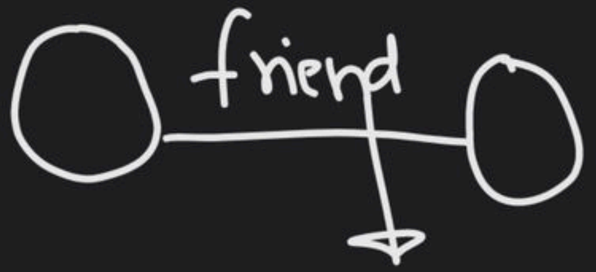
Each entry → 0
→ 1

$A_{ij} = 1$ when node i is adjacent to node j



$$A = \begin{array}{c} \\ 1 \\ 2 \\ 3 \\ 4 \end{array} \begin{array}{c} \begin{array}{cccc} 1 & 2 & 3 & 4 \end{array} \\ \begin{bmatrix} 0 & 1 & 1 & 1 \\ 1 & 0 & 0 & 1 \\ 1 & 0 & 0 & 1 \\ 1 & 1 & 1 & 0 \end{bmatrix} \end{array}$$

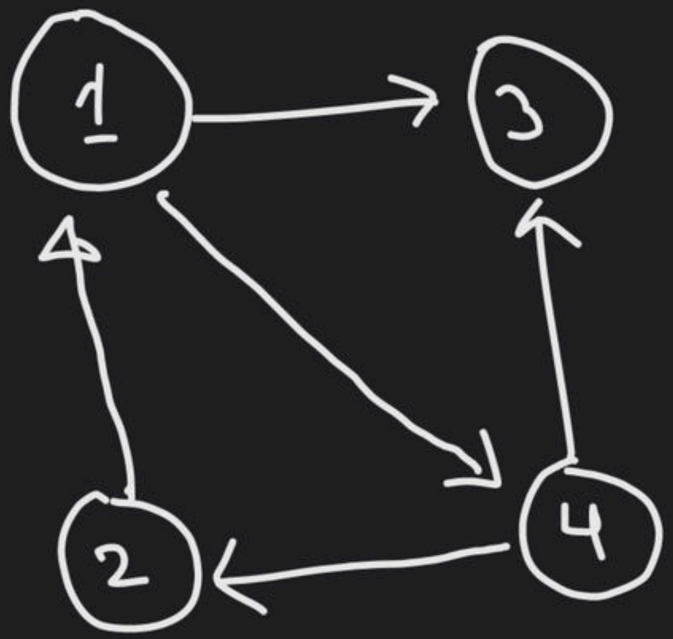


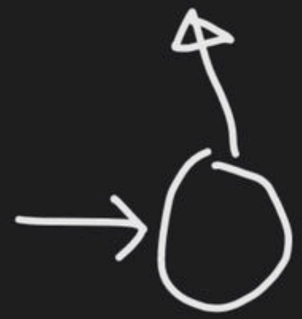


directed edge | undirected edge

bidirectional

$$A = \begin{array}{c} \\ 1 \\ 2 \\ 3 \\ 4 \end{array} \begin{array}{c} \begin{array}{cccc} 1 & 2 & 3 & 4 \end{array} \\ \begin{bmatrix} 0 & 0 & 1 & 1 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 1 & 1 & 0 \end{bmatrix} \end{array}$$





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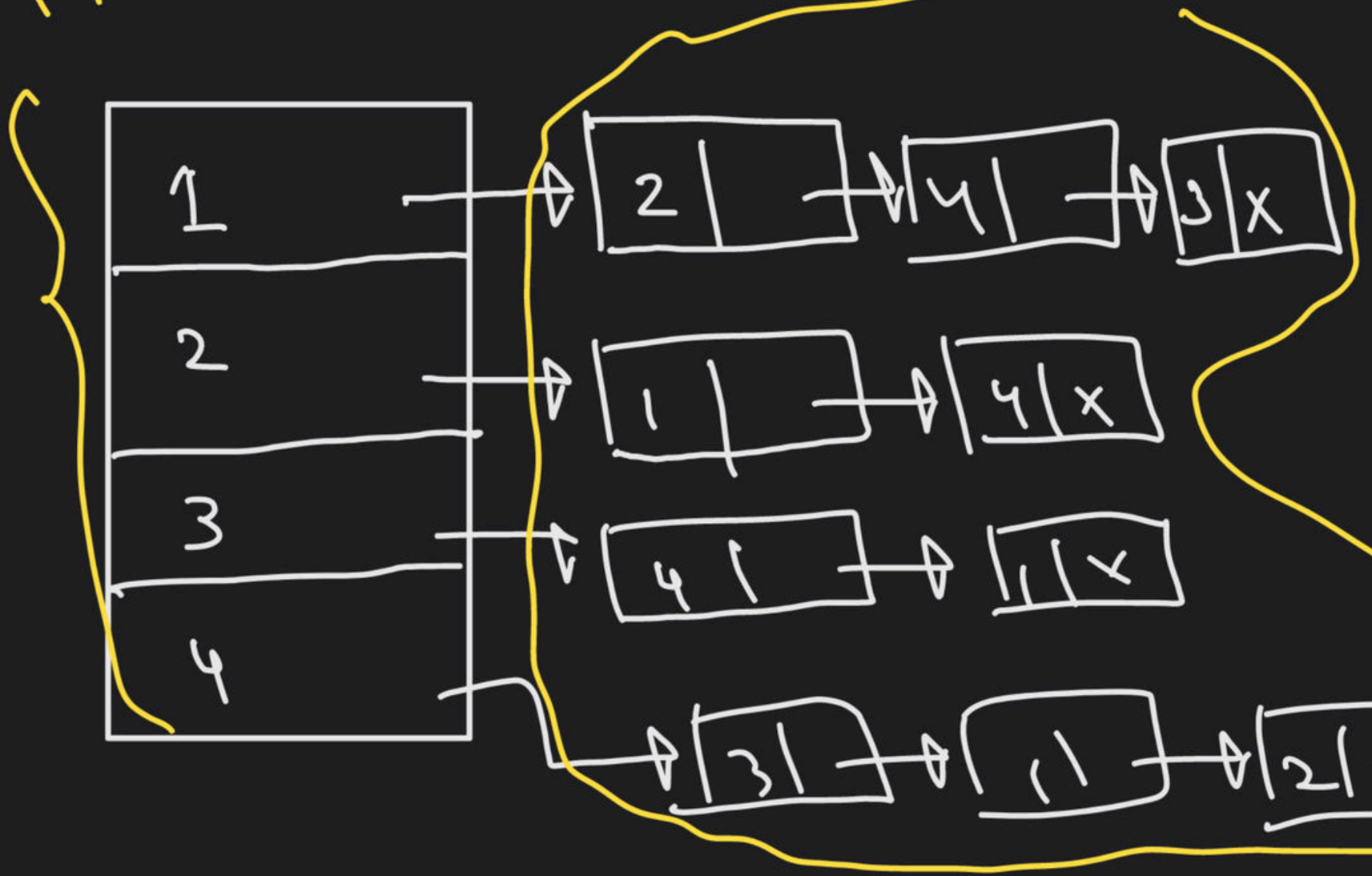
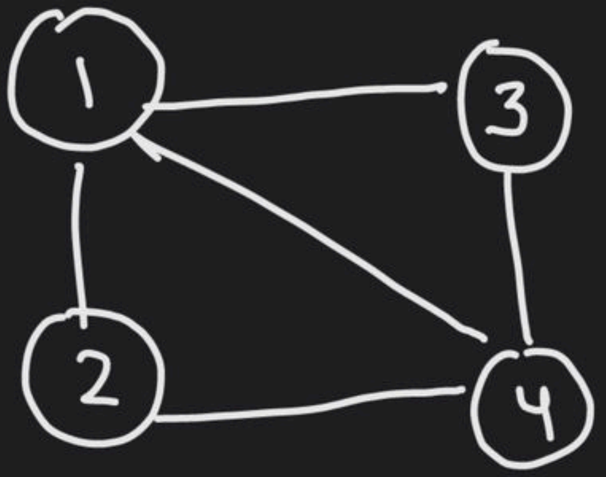
Adjacency List

|V|

2|E|

|V| + 2|E|





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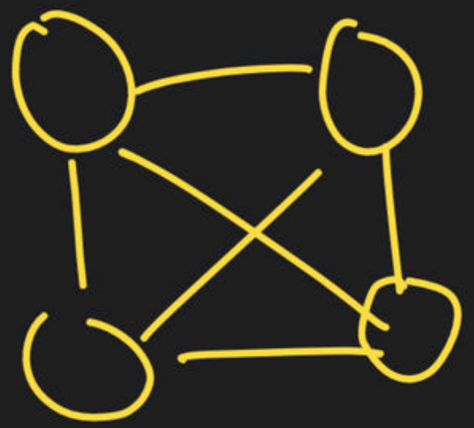
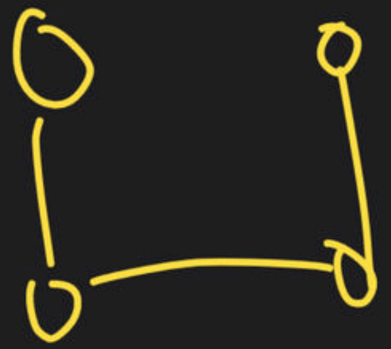
Dense

Sparse

① Complete Graph

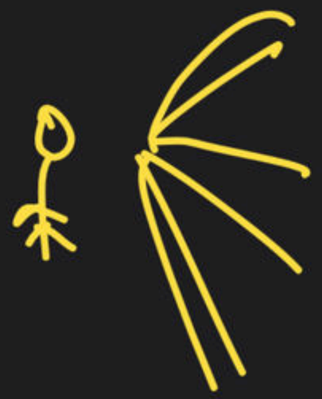




hxn →

fB → 10^{10} $n = 10^{10}$

Adj Matrix ⇒ $10^{10} \times 10^{6}$



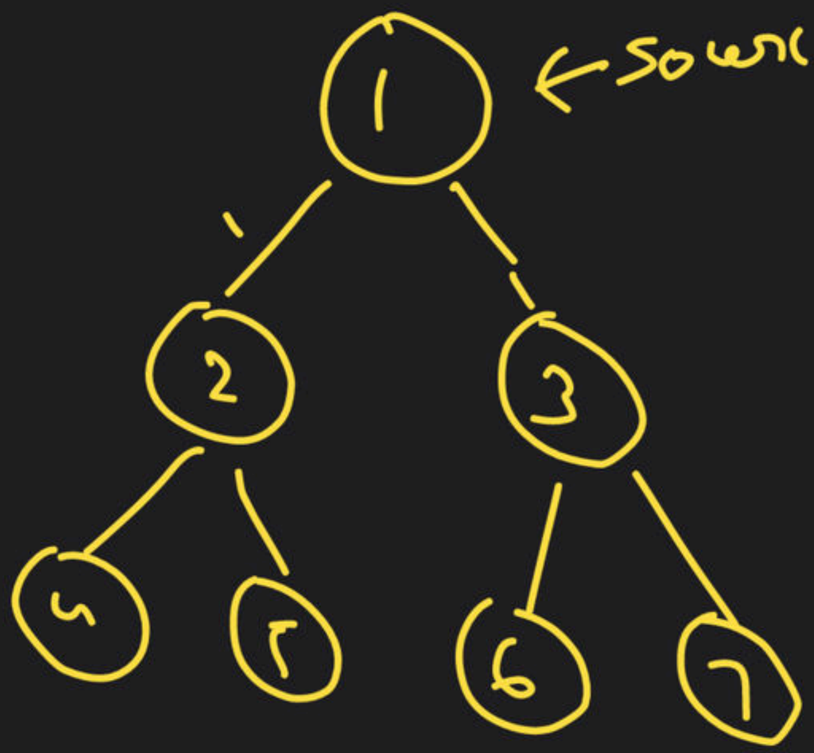
5000

Traversal

- DFS
- DFS

(i) visit

(ii) Explore



BFS

$1 \rightarrow \underline{\{2,3\}} \rightarrow \underline{\{4,5,6,7\}}$

1 2

Queue :

stack :

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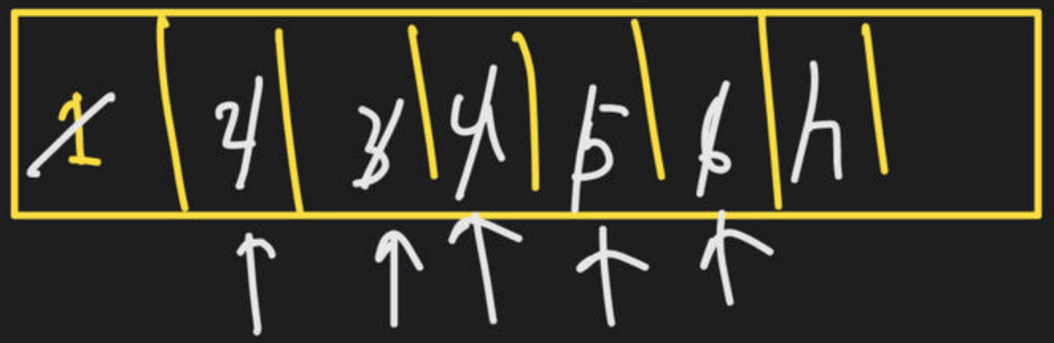
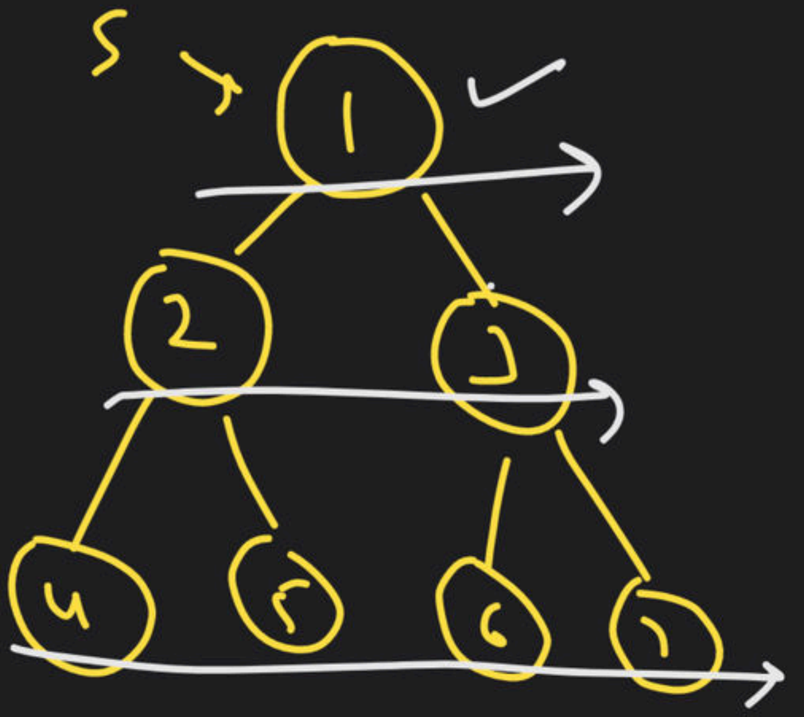
Queue



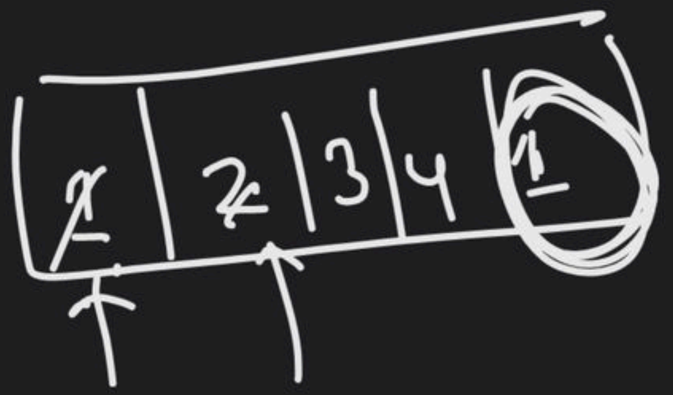


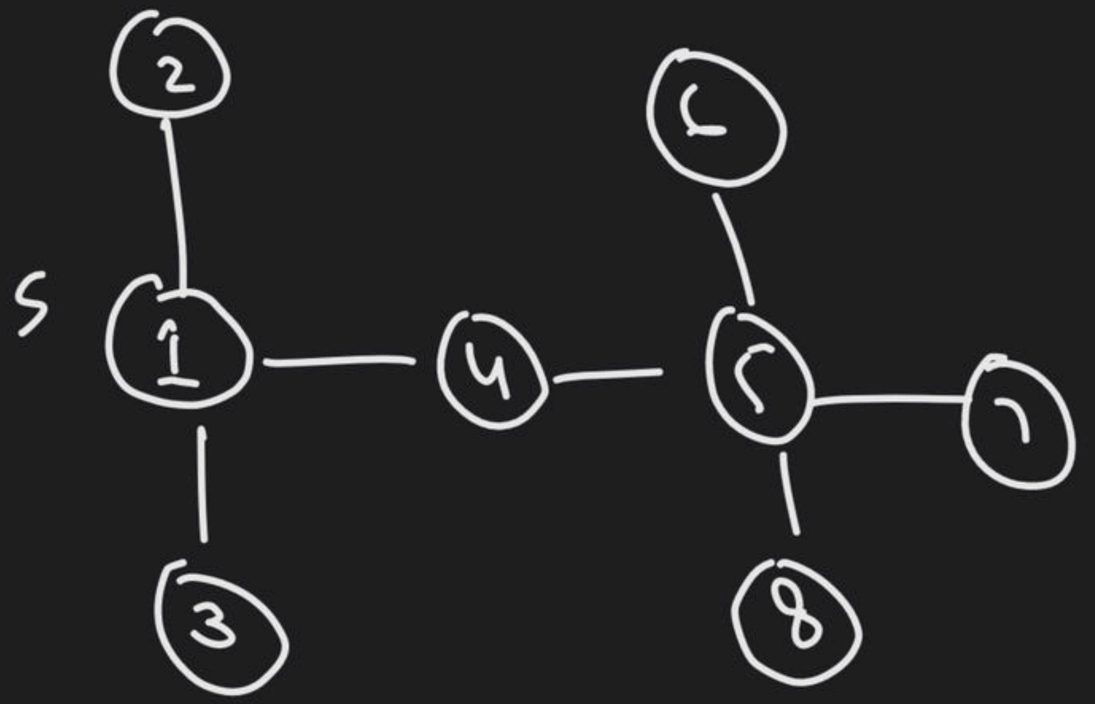

```
while(q is not empty)
    {
    u = dequeue()
    print(u);
    q.push(q->left);
    q.push(q->right);
```

root
complete
core.

1 2 3 4 5 6 7

1 2
dict did-





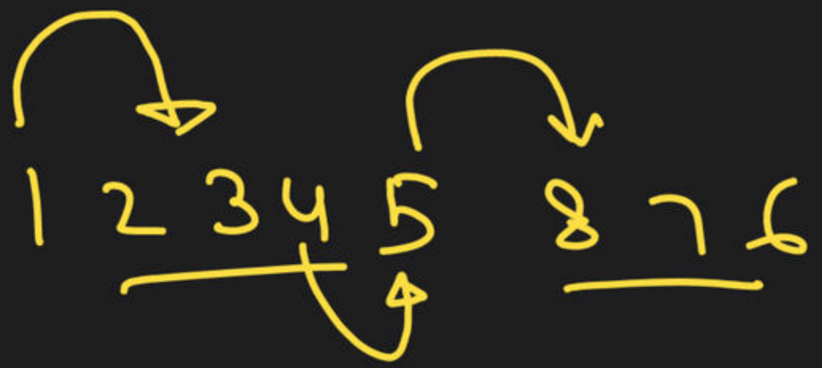
Another d.s.

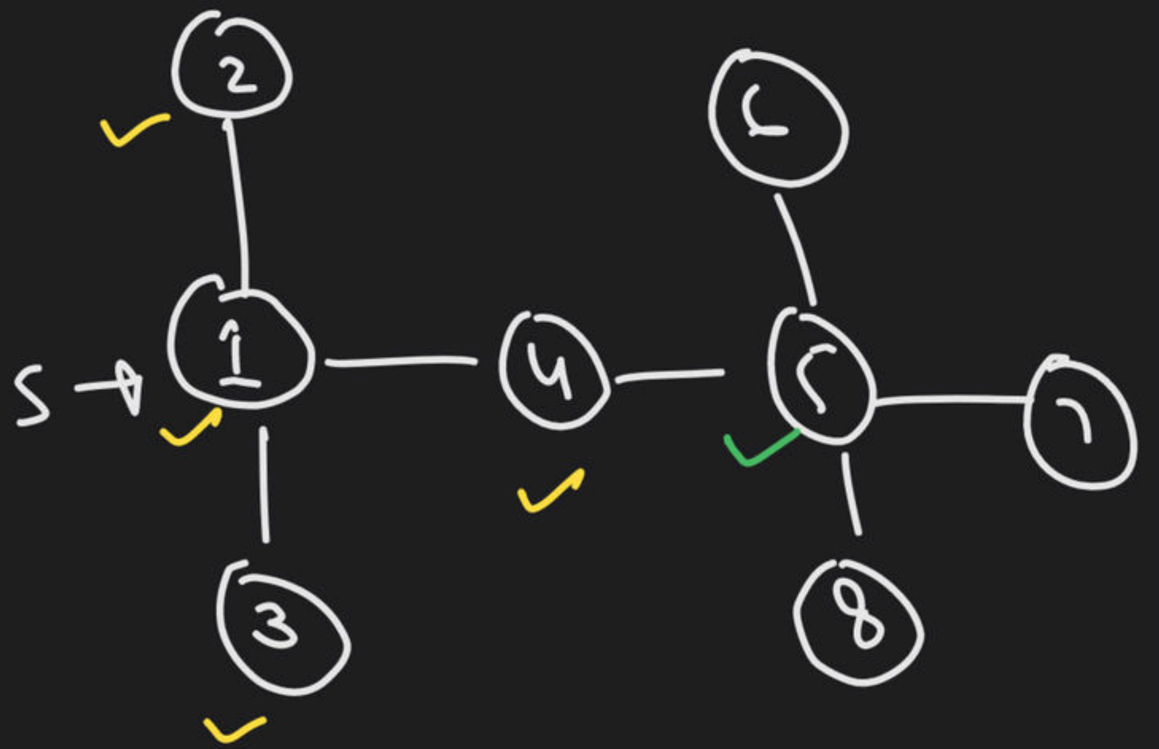
⇒ visited [ ]

1 2

Q

visited 1 2 3 4 5 6 7 8





1(2 3 4)5(8 7 6)

1 2 3

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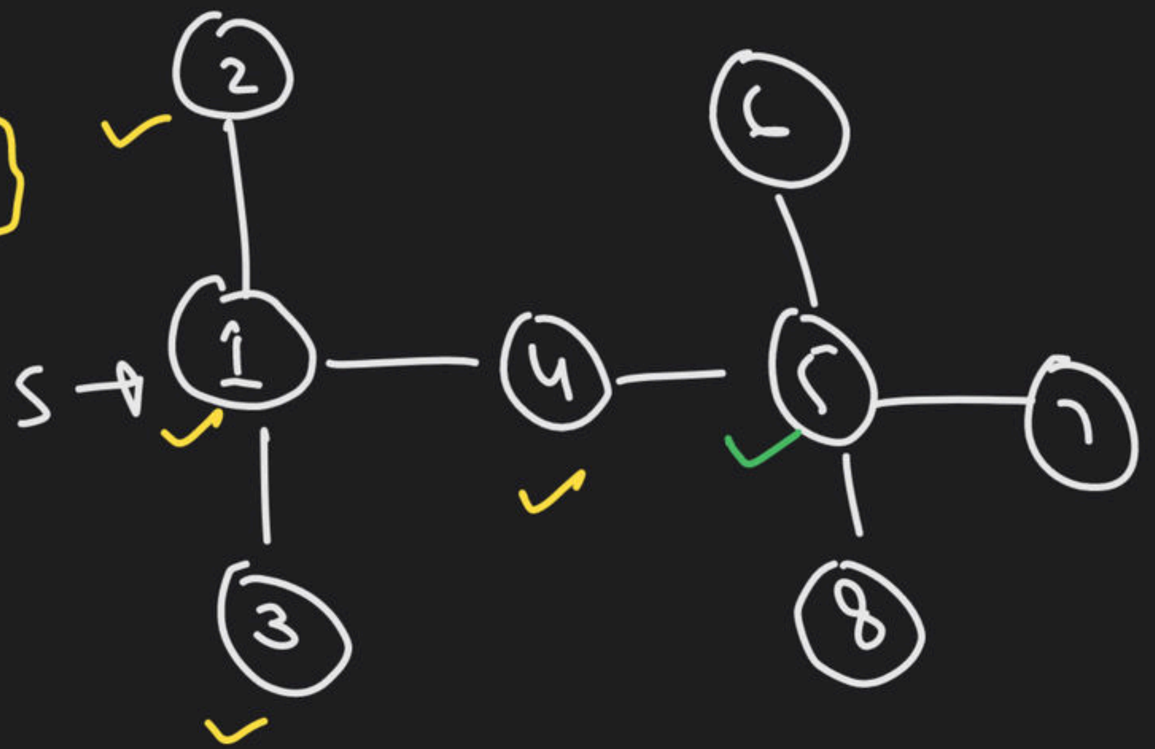
$1 \rightarrow \{2,4,3\} \rightarrow \{5\} \rightarrow \{7\ 6\ 8\}$



1 2 4 3 5 7 6 8

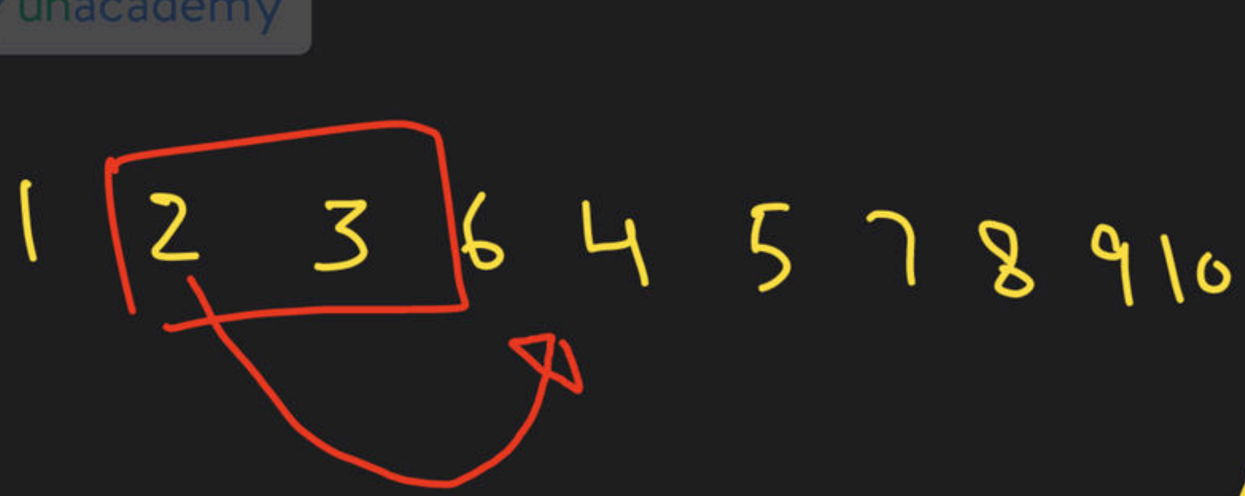
1 2 4 3 5 6 7 8

1 2 4 3 5 6 8 7

1 2 4 3 5 7 8 6

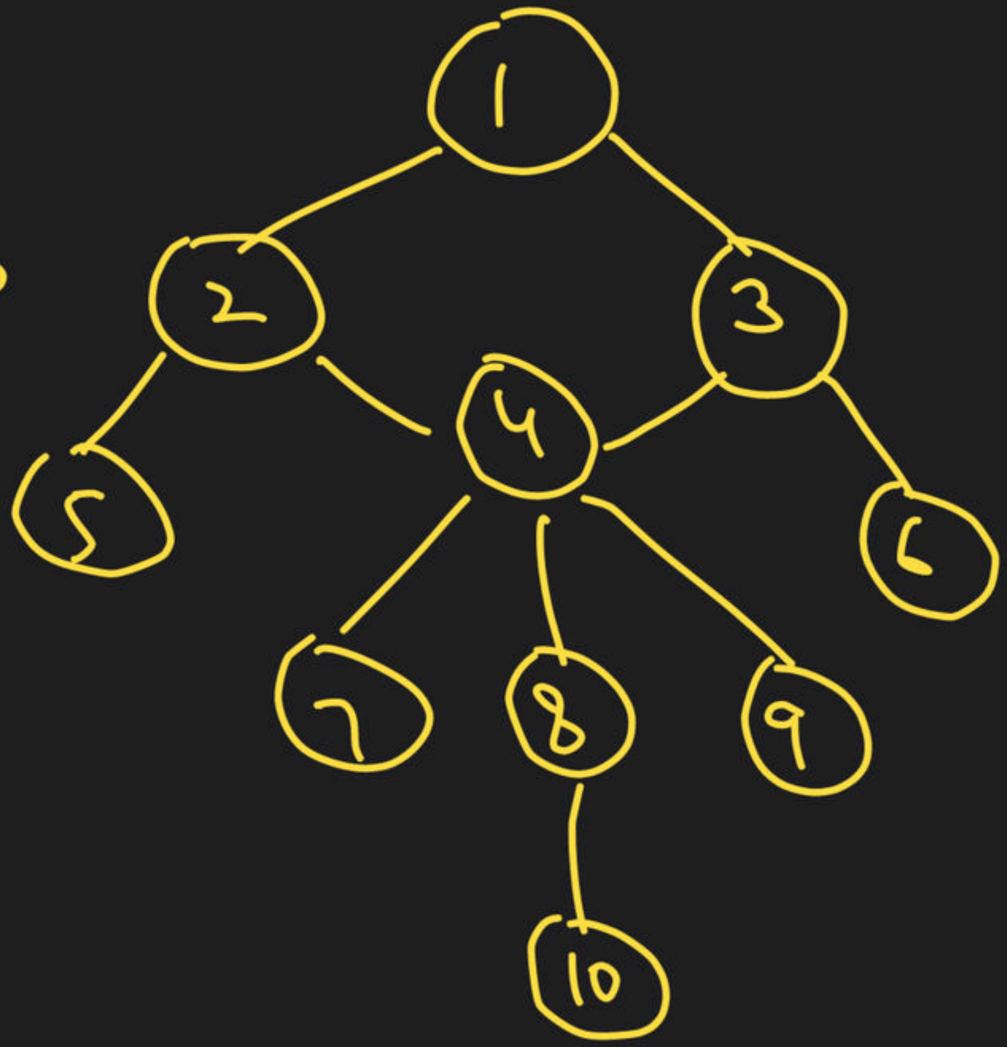
1 2 4 3 5 8 7

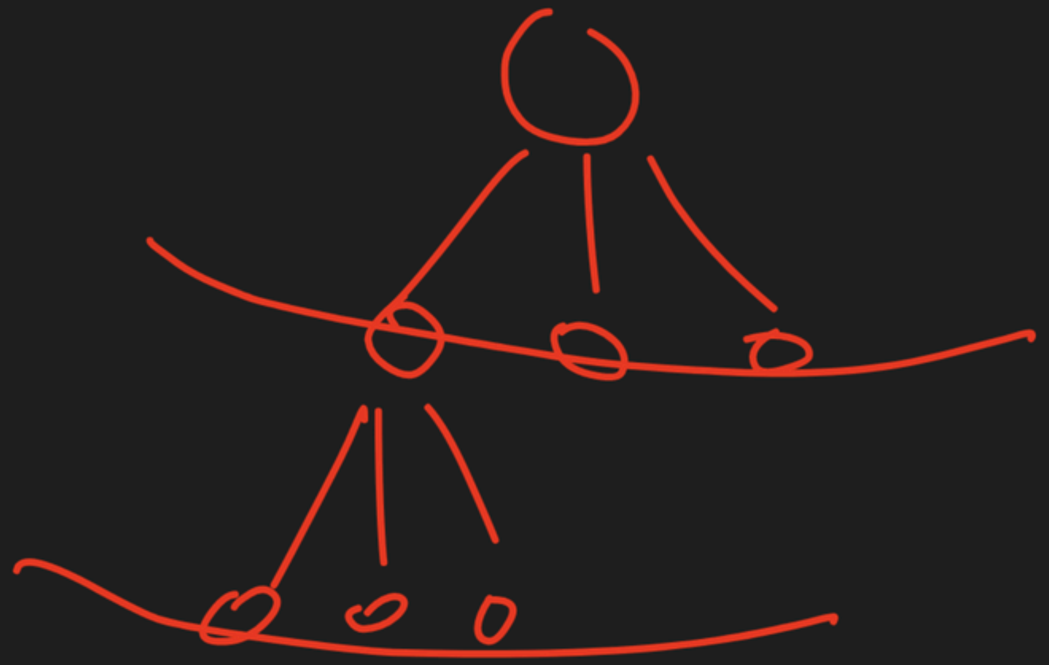
1 2 4 3 5 8 7 6



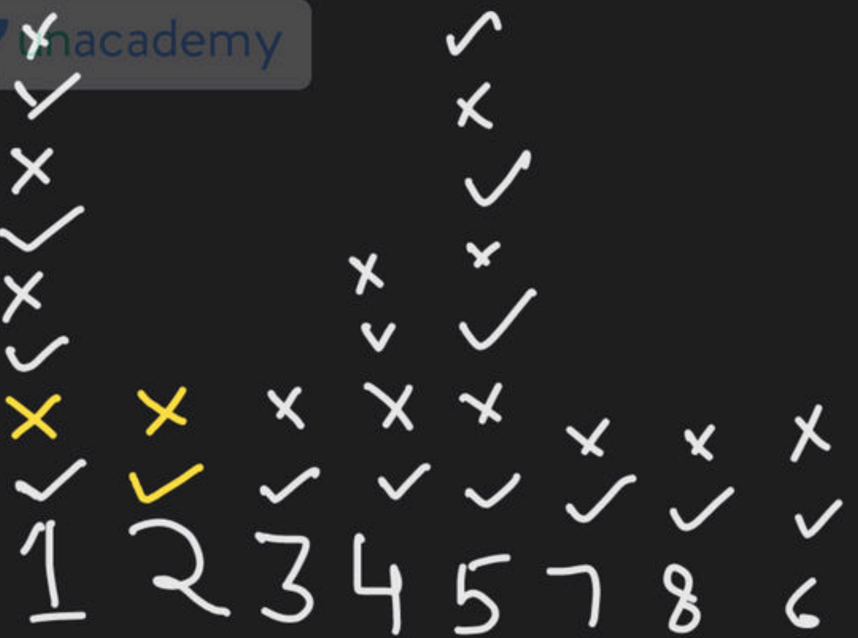
4 5

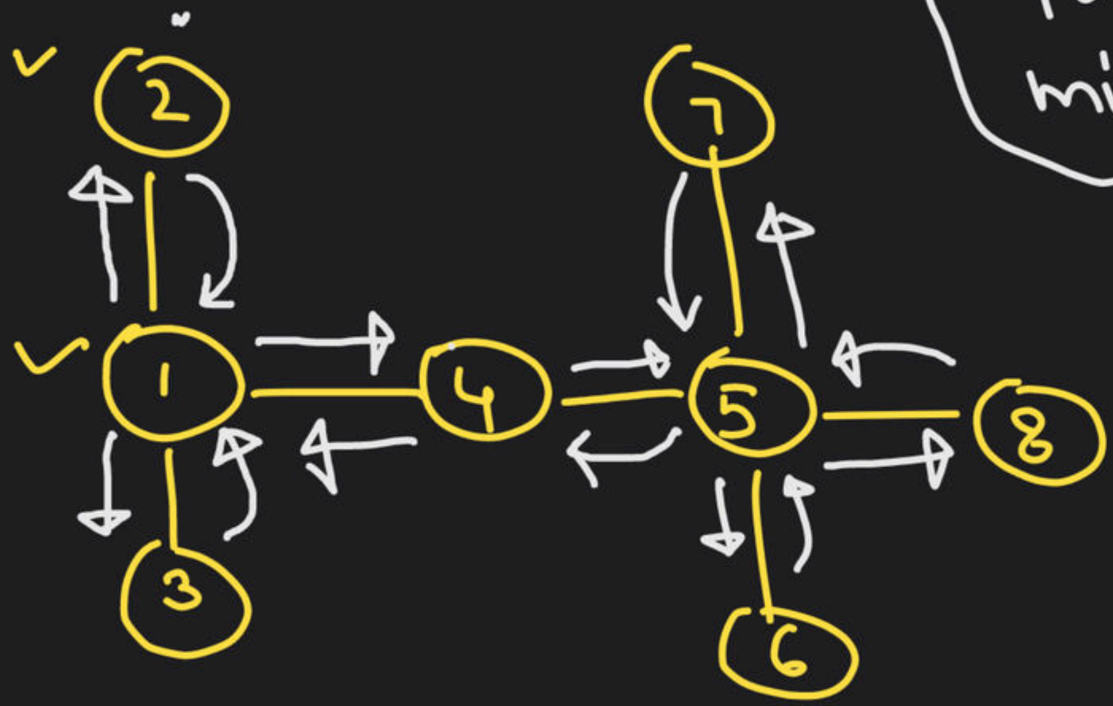
5 4





DFs





40 - 50 min

1 2 3 4 5 7 8 6

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THANK YOU!

Here's to a cracking journey ahead!