Indian Institute of Science
Bangalore, India
भारतीय विज्ञान संस्थान
बंगलौर, भारत

DS221

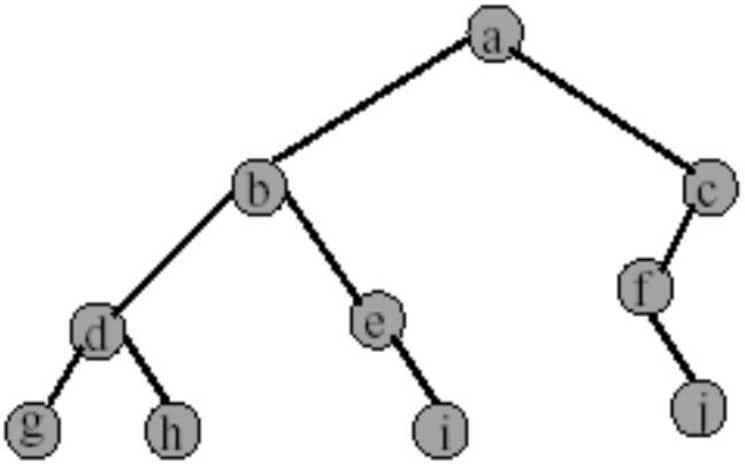
Data Structures, Algorithms & Data Science Platforms

Instructor: Chirag Jain

CDS
The Department of Computational and Data Science

Exercise 1

Level Order Traversal of Binary Tree

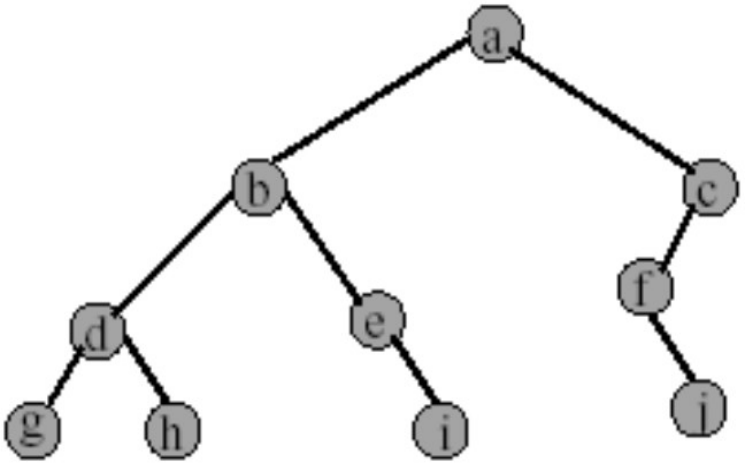


Output: a b c d e f g h i j

Recall Queue

- **FIFO** Principle: *First in, First Out*
- Elements **enqueued only at rear end** and **dequeued from front**
- Also called "Head" and "Tail"

Level Order Traversal of Binary Tree



Output: a b c d e f g h i j

Algorithm

```
void levelOrder(BinTreeNode *t) {
  Queue<BinTreeNode*> q;
  while (t != NULL) {
    visit(t);      // visit t
   // push children to queue
    if (t->left) q.enqueue(t->left);
    if (t->right) q.enqueue(t->right);
    t = q.dequeue(); // next node to visit
  }
}
Call levelOrder(root)
```

Level Order Traversal of Binary Tree

Algorithm

```
void levelOrder(BinTreeNode *t) {
  Queue<BinTreeNode*> q;
  while (t != NULL) {
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  }
}
Call levelOrder(root)
```

Input: Tree with n nodes

Measure the following using Big-Oh measure:

(i) worst-case runtime & (ii) space complexity

(iii) best-case runtime & (iv) space complexity

(v) average-case runtime & (vi) space complexity

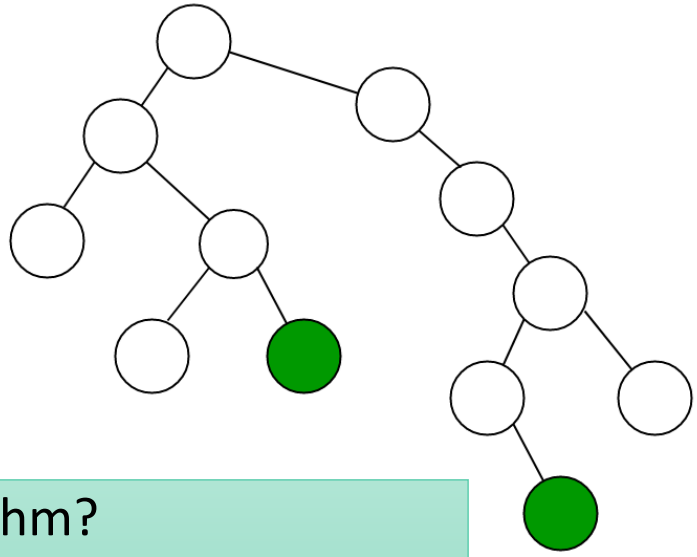
WRITE ALL SIX ANSWERS ON YOUR ROUGH SHEET

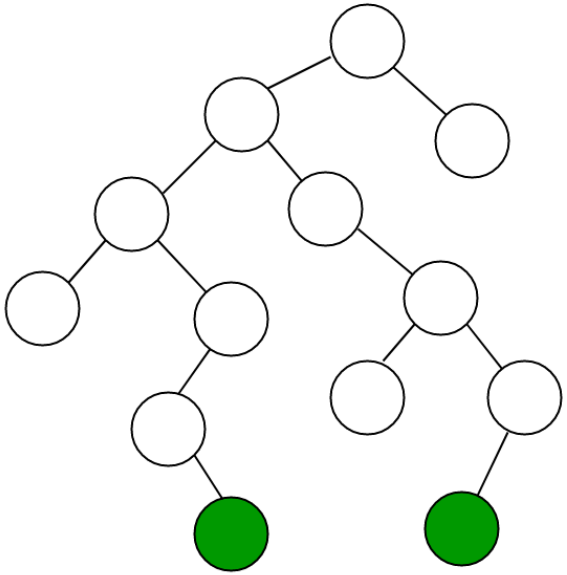
Exercise 2

Diameter of a binary tree

The diameter of a binary tree is the length of the longest path between any two nodes

Note that the length of a path between two nodes is calculated by the number of edges between them.





Algorithm?
Pseudo-code?
Worst-case runtime?

Tasks

- Suggested readings before next lecture
  - Hashing (from online sources)
  - B-Trees (from online sources)

- Programming assignment 2 is available now
  - Due Sept 24 18:00
  - https://github.com/DS221-2021/Assignment2