# PG4200 Algorithms and Data Structures

# Re-sit exam

## 6/8/2025

Candidate: 31

### Question 3:

### LO2: Searching Algorithms

Algorithm – Deleting a Node in a BST

There is three cases when deleting a node in a Binary Search Tree (Gupta, n.d):

1. Node is a leaf (No children 🡪 Simply remove it
2. Node has one child 🡪 Remove node, connect its parent to the child
3. Node has two children 🡪

* Find in-order successor(smalles value in right subtree) or in-order predecessor(largest value in left subtree)
* Replace node´s value with successor/predecussor value
* Delete the successor/predecessor from the subtree

Deleting node 60 in the given BTS (*algorithm adapted from Sedgewick & Wayne, 2011):*

1. Start at root 90 🡪 go left because 60 < 90
2. Node 60 has two children

* Left child: 25
* Right child: 75

We must find in-order successor: the smalles value in the right subtree

1. Find in-order successor – right subtree of 60 is:

75

/ \

65 85

Smallest value = 65 (left in this subtree)

1. Replace 60 with 65

Tree now looks like:

90

/ \

65 95

/ \

25 75

/ \ / \

15 30 65 85

1. Delete original 65 node

Original 65 was a leaf node (no children) in the right subtree of 75. We romove it.

Final BTS:

90

/ \

65 95

/ \

25 75

/ \ \

15 30 85

Et bilde som inneholder tekst, håndskrift, nummer, Font

KI-generert innhold kan være feil.Step-by-step graphical solution:

## Referances

Goodrich, M. T., & Tamassia, R. (2006). Data Structures and Algorithms in Java (4th ed., Ch.10.3). Wiley.

Sedgewick, R., & Wayne, K. (2011). Algorithms (4th ed., Ch.3.2). Addison‑Wesley.

Gupta, R. (n.d.). LO 2: Searching Algorithms [Lecture slides]. Kristiania University College.