

# PE424001 Algorithm and Data Structure

## Assignment 1

(25% of the module score)

1. (9 Marks)

A) Insert into an initially empty binary search tree items with the following keys (in this order): 30, 40, 23, 58, 48, 26, 11, 13. Draw the tree after each insertion. (3 Marks)

B) Remove from the binary search tree (Figure 1) in the following keys (in this order): 65, 76, 88, 97. Draw the tree after each removal. (3 Marks) (Try to replace the deleted node with the smallest value at right hand side first)

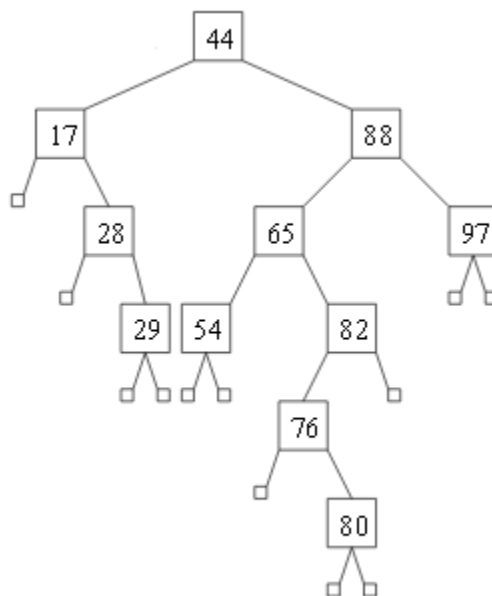


Figure 1 Tree for Q1B

C) (3 Marks) Given a tree (Figure 2)

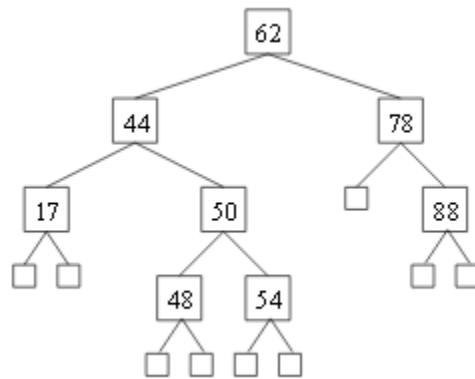


Figure 2 Tree for Q1C

Draw the AVL tree with balancing factors resulting from the insertion of an item with a key 52 into the AVL tree

2. (9 Marks)

**Before**

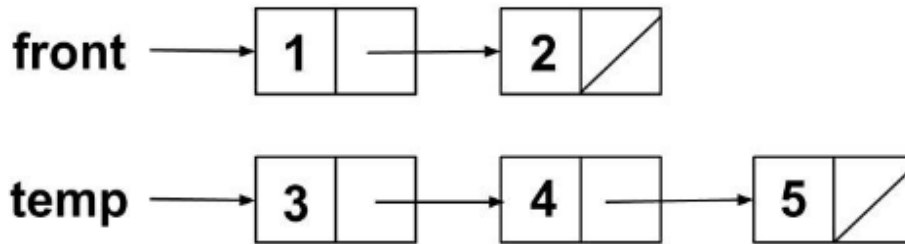


Figure 3 Two linked list structures

A) Given pointers *front*, *temp* and *current* (not shown in figure) of a linked list data structure. Write down the node connection after each of the operation below. For example,

*front.next.next=temp* the node connection becomes 2 -> 3

i) *current = front.next*; (0.5 Mark)

ii) *front.next = temp.next.next*; (0.5 Mark)

iii) *temp.next.next = front*; (0.5 Mark)

iv) *current.next = temp.next*; (0.5 Mark)

v) *temp.next = current*; (0.5 Mark)

vi) *front = temp*; (0.5 Mark)

vii) Draw the final linked list structure after the above (step i to vi) steps. (2 Marks)

B) Figure 4 shows a linked list data structure with data, address and pointers in each node.

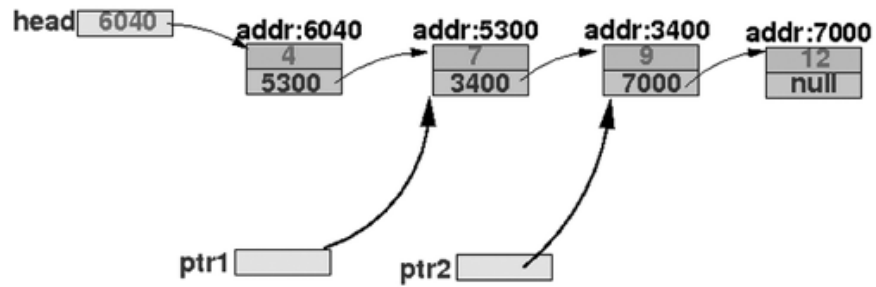


Figure 4 Linked list structure with data and pointers

- i) Write one code segment (see below) so that node with data '9' will be removed. (2 Marks)

*//Code segment for Q2 B i)*

*if ( '9' was found in the list )*

*{*

*// This will delete the node with data '9'*

*}*

*else*

*{*

*// do nothing !*

*}*

- C) What are the advantage and disadvantage of using linked list to store data over array? (2 Marks)

3. (7 Marks) Given an input array

[ 5 2 6 1 7 9 4 3]

a) Trace the action of:

- 1 Selection Sort (All steps correct 1 Marks)
- 2 Bubble Sort (All steps correct 1 Marks)
- 3 Insertion Sort (All steps correct 1 Marks)
- 4

b) Discuss the worst case of Bubble Sort in terms of Big-O. (2 Marks)

c) Compare the below sorting algorithms **worst** performance in terms of Big-O (All correct 2 Marks)

QuickSort	Selection Sort	Insertion Sort

## Submission

- **DEADLINE: 22:00:00 29th July, 2021**

- **Submission method:**

1. Zip up all the files and name the zip file to “[Last name]\_[First name].zip”. (E.g. Chan\_Peter.zip)
2. Send the zip file to [alexng88@vtc.edu.hk](mailto:alexng88@vtc.edu.hk)
3. Enter “ADS Assignment 1 Submission – [Last name] [First name]” in the subject.
4. Marks will be deducted if you don’t follow the submission method.

1 week	Your marks x 90%
2 weeks	Your marks x 80%
More than 2 weeks	Your marks x 0%

**Marks will be deducted on late submission.**

## Marking Scheme

This assignment contributes 25% of the final grade of PE424001  
The full mark for this assignment is 25 marks, which break down into:

- Question 1 & 2 contributes 9 marks each.
- Question 3 contributes 7 marks.

**- End -**