

CSE 202 Midterm 2

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I. QUESTION (HASHING) (20 POINTS)

Write two methods

```
int hashFunction(ListNode node)
int hashFunction(LinkList list)
```

which calculate the hash value of a list node and a singly link list. The hash value of a link list is the sum of hash values of its nodes. In order to implement the second function you have to use the first function.

II. QUESTION (HASHING) (15 POINTS)

Write the method

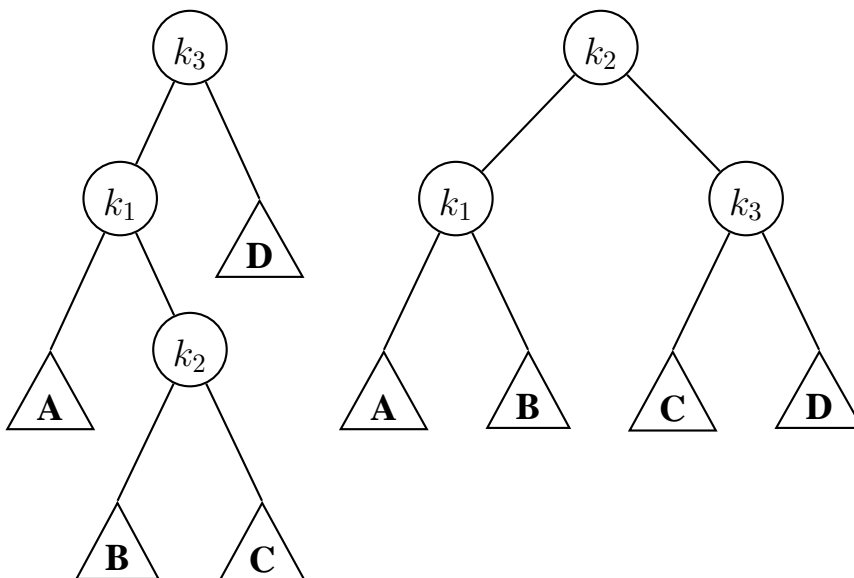
```
void removeNode(Node deleted)
```

which removes a node from the hash table. Assume that linear probing was used as a collision strategy.

III. QUESTION (SEARCH TREES) (15 POINTS)

Write the method for the following double rotation in AVL trees.

```
AvlNode rotate(AvlNode k3)
```



IV. QUESTION (SEARCH TREES) (15 POINTS)

Write the method

```
int lowerThanX(int X)
```

which returns the number of nodes in the binary search tree which have value less than X .

V. QUESTION (QUEUE) (20 POINTS)

Modify the methods (in array implementation)

```
void enqueue(Node newNode)
Node dequeue()
```

such that the new queue data structure is not LIFO (last in first out) but FILO (first in last out).

VI. QUESTION (QUEUE) (15 POINTS)

Write the method

```
int max()
```

which finds the maximum element in the queue. You are only allowed to use enqueue and dequeue operations. The items and order of items must stay the same after the execution of this function. (Hint: Use an external queue)