CSC230

Intro to C++ Lecture 25

Final Exam Overview

- All the materials with focus on the second half
- True or False ()
- 10 Questions

Sample Questions

- Suppose we have an array 15, 23, 20, 10, 13, 6, 18, 35, 23
  - How to perform binary search on this array?
  - Search 18 (in detailed steps)

Sample Questions

- Insert the following sequence of keys into an empty binary search tree: 15, 23, 20, 10, 13, 6, 18, 35, 23 (a duplicate), 9, 24
  - Draw the figure to show this tree
  - Is the resulting tree balanced?
  - What will the tree from part (a) look like after deleting the following items: 6, then 15, then 20
  - Is the resulting tree balanced?

Sample Questions

- Suppose that items A, B, C, D and E are pushed, in that order, into an initially empty stack S.
- S is then popped four times;
- as each item is popped off, it inserted into an initially empty queue.
- If two items are then removed from the queue, what is the next item that will be removed from the queue?

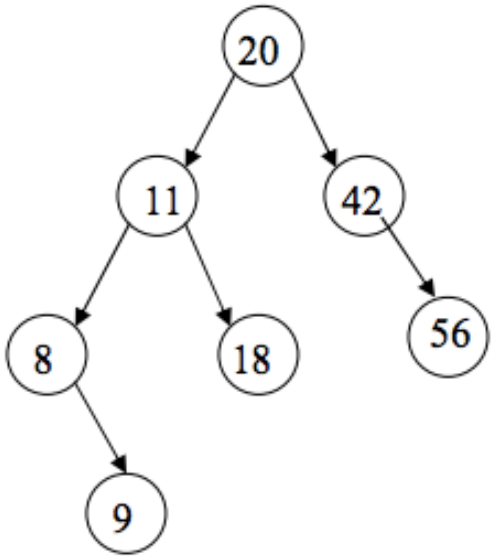
Sample Questions

- Give traversals of the tree shown below:
  - Pre-Order / Post-Order / In-Order

20, 11, 8, 9, 18, 42, 56

9, 8, 18, 11, 56, 42, 20

8, 9, 11, 18, 20, 42, 56

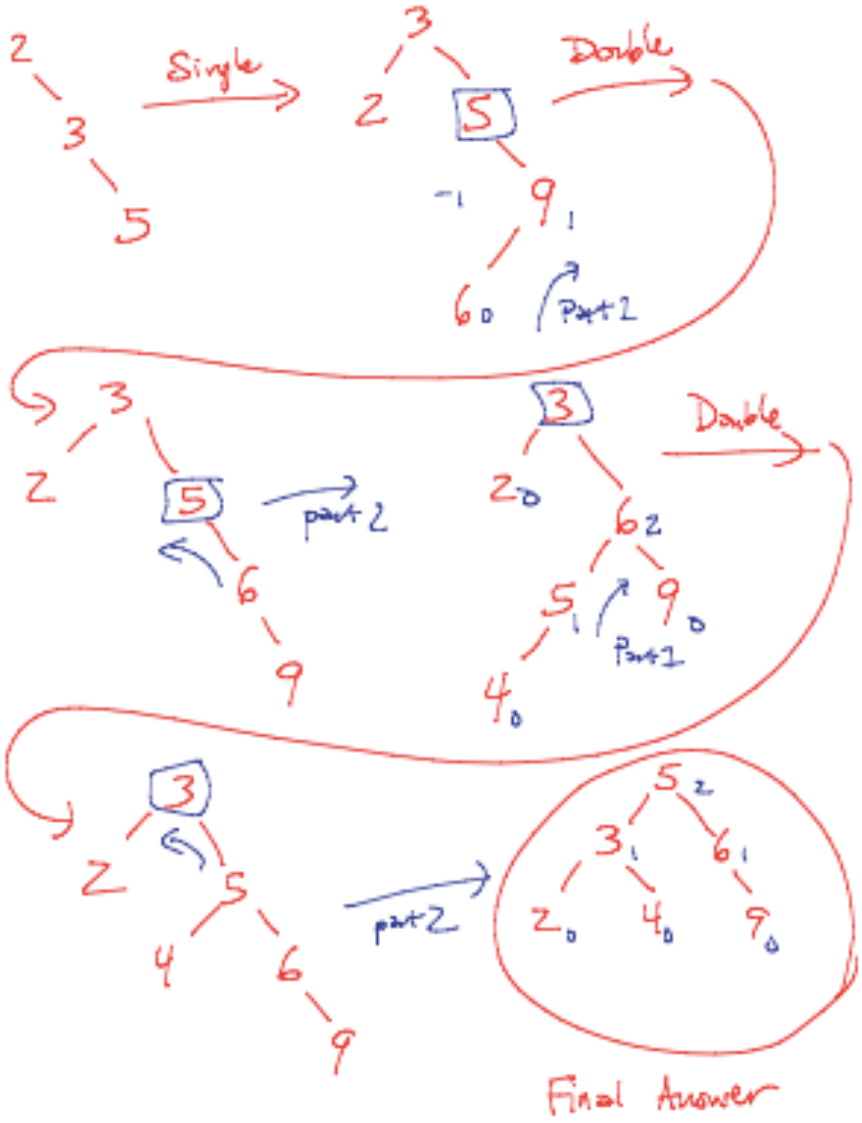


  - Is it an AVL Tree? binary search tree? full binary tree?

Yes. Yes. No

Sample Questions

- AVL Tr… n inserting the keys: 2, 3, 5, 9 …pty AVL tree.



Sample Questions

- How to define a template?
- What is the output of the following code?
  - Example final-1.cpp / final-2.cpp

Sample Questions

- What is a hash function? Consider a hash table of size seven, with starting index zero, and a hash function (3x + 4) mod 7. Assuming the hash table is initially empty, what should the hash table look like when the sequence 1, 3, 8, 10 is inserted into the table using closed hashing?
- Note that use '_' denotes an empty location in the table.

- How to deal with collision?
  - linear probing
  - separate chaining
  - double hashing

Sample Questions

- Show the steps of quick sort 7, 39, 20, 11, 16, 5 pivot, swaps, resulting subarrays
  - For each step we choose the first element as the pivot.
  - Which one will be the worst pivot?

Sample Questions

- Show the steps of merge sort, 7, 39, 20, 11, 16, 5, 9, 28

- Other sorting algorithms : insertion / selection sort

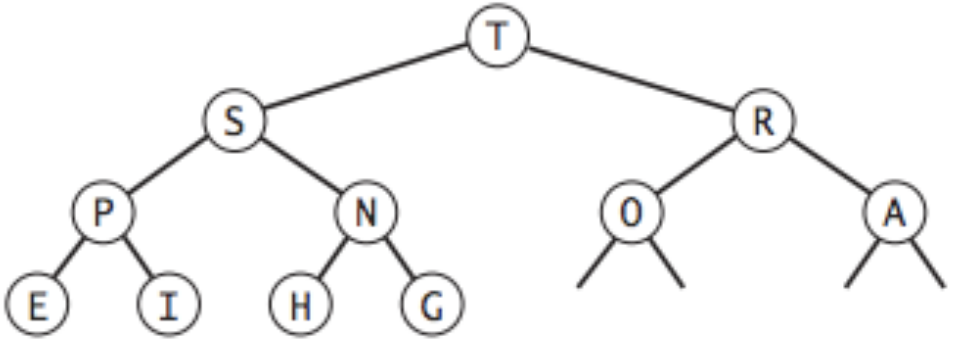
Sample Questions

- Show the steps of merge sort, 7, 39, 20, 11, 16, 5, 9, 28

Sample Questions

- Heap

Consider the following max-heap.



(a) Draw the heap that results after inserting the key Z.

- Draw the heap that results after deleting the maximum key from your answer to (a).
- What is the array representation of this heap?

Sample Questions


```
public static int f1(int N) {
    int x = 0;
    for (int i = 0; i < N; i++)
        x++;
    return x;
}
```

A. $\log N$

B. N

C. $N \log N$

D. N^2

E. 2^N

F. $N!$

Sample Questions


```
public static int f2(int N) {
   int x = 0;
   for (int i = 0; i < N; i++)
      for (int j = 0; j < i; j++)
         x++;
   return x;
}
```

A. $\log N$

B. N

C. $N \log N$

D. N^2

E. 2^N

F. $N!$

Sample Questions


```
public static int f3(int N) {
   if (N == 0) return 1;
   int x = 0;
   for (int i = 0; i < N; i++)
      x += f3(N-1);
   return x;
}
```

A. $\log N$

B. N

C. $N \log N$

D. N^2

E. 2^N

F. $N!$

Sample Questions


```
public static int f4(int N) {
   if (N == 0) return 0;
   return f4(N/2) + f1(N) + f4(N/2);
}
```

A. $\log N$

B. N

C. $N \log N$

D. N^2

E. 2^N

F. $N!$

Sample Questions


```
public static int f5(int N) {
   int x = 0;
   for (int i = N; i > 0; i = i/2)
      x += f1(i);
   return x;
}
```

A. $\log N$

B. N

C. $N \log N$

D. N^2

E. 2^N

F. $N!$

Sample Questions


```
public static int f6(int N) {
   if (N == 0) return 1;
   return f6(N-1) + f6(N-1);
}
```

A. $\log N$

B. N

C. $N \log N$

D. N^2

E. 2^N

F. $N!$

Sample Questions


```
public static int f7(int N) {
   if (N == 1) return 0;
   return 1 + f7(N/2);
}
```

A. $\log N$

B. N

C. $N \log N$

D. N^2

E. 2^N

F. $N!$