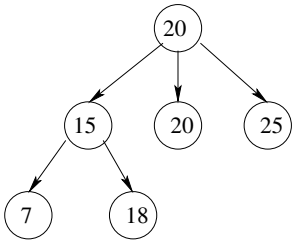
EECS 268 Home-Work 7 – Fall 2012

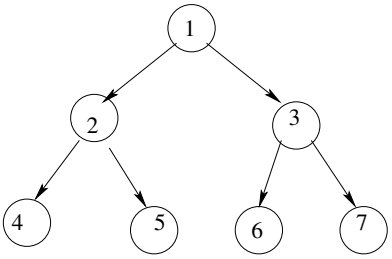
Do not write you name on this answer sheet (only your KU-ID). Total: 55 points

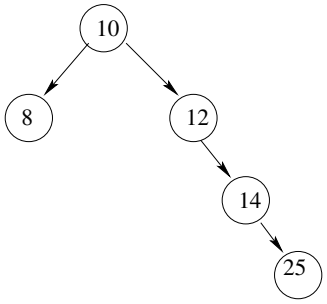
KU ID: _____

1. State true or false: **(5 points)**
   - The inorder traversal of a binary search tree T will visit its nodes in sorted search-key order.
   - The minimum height of a binary tree with n nodes is $log_2(n+1)$.
   - The average case complexity of insertion in a binary search tree is $O(log_2 n)$.
   - Updating the *key* item of a Table node is not permitted.
   - A *heap* can become unbalanced with insertions and deletions over time.

2. Given the following tree categories: (a) binary tree, (b) complete binary tree, (c) full binary tree, (d) general tree, and (e) binary search tree,
   Apply all the applicable categories to the following trees. **(5 points)**

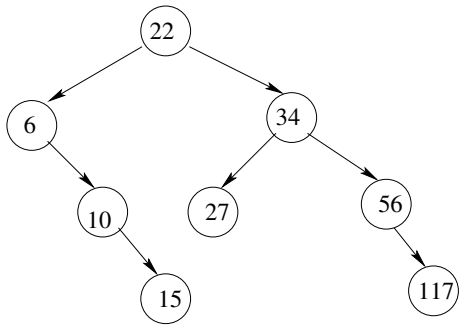






3. Arrange the following nodes in a binary search tree form in the order given: 25, 6, 4, 30, 2, 55, 6, 60, 12. **(4 points)**
   Is the tree balanced? Why or why not? **(2 points)**
   Print out the nodes in (a) pre-order, (b) post-order, (c) in-order. **(3 points)**

4. Given the following binary search tree, illustrate the binary tree structure after *each* of the following node deletions in the order: 6, 22, 27. **(5 points)**

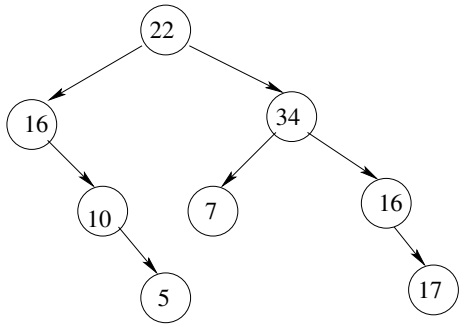


5. Given a pointer-based representation of binary tree (as on class slides 30–47), write an algorithm to deallocate all nodes in the tree. The *TreeNode* structure is as below. **(5 points)**

```
class TreeNode {
private:
    TreeNode() {};
    TreeNode(const int& nodeItem, TreeNode *left = NULL,
             TreeNode *right = NULL): item(nodeItem),
             leftChildPtr(left), rightChildPtr(right) {}

    int item;                // data portion
    TreeNode *leftChildPtr;  // pointer to left child
    TreeNode *rightChildPtr; // pointer to right child
    friend class BinaryTree; // friend class
 };
```

6. Illustrate (with figure) the array representation of the following binary tree. **(5 points)**



7. Explain the Table implementation you will choose in the following cases (sorted/unsorted array/LL, BST). Why? **(4 points)**

   (a) English dictionary; only needs a retrieval operation.

   (b) Word processor spell checker; compares words in your document with words in its dictionary; can add new words to its dictionary when necessary; needs frequent retrieval and occasional insertion.

8. Why is a binary search tree not particularly suitable for implementing a priority queue? What data structure would you choose instead? Why? **(5 points)**

9. Use open hashing and the hash-function: h(x) = x mod 11 to insert the following elements in the hash-table: 3, 5, 7, 82, 58, 69, 113.
(3 points)

10. Use closed hashing to and the hash-function: h(x) = x mod 11 to insert the following elements in the hash-table: 3, 5, 7, 82, 58, 69, 113.
(4 points)
Use the following collision resolution techniques (one at a time): (a) Linear probing (b) Quadratic probing

11. Given the following max-heap, illustrate the *individual* steps in which the heap changes for each for the following operations: (a) Insert 16, (b) delete. **(5 points)**