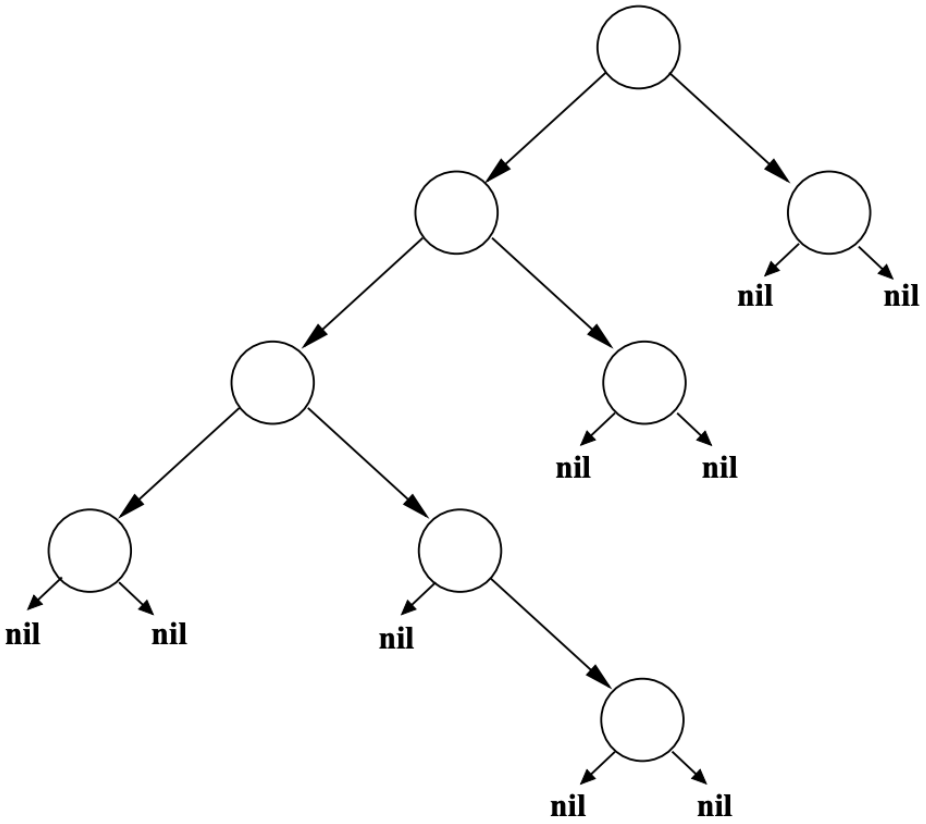
CS 5800 – Assignment 3 – online submission – Mar 02, 2020 6 PM PST

1. Red-Black Tree (10x3=30 pts.)

(A) Assign the keys 2, 3, 5, 7, 11, 13, 17, 19 to the nodes of the binary search tree below so that they satisfy the binary-search-tree property.



(B) State if this binary search tree can be colored to form a legal red-black tree? Explain your answer.

(C) The binary search tree can be transformed into a red-black tree by performing a single rotation. Draw the red-black tree that results, labeling each node with a "red" or "black". Also include the keys from part (A).

2. Generalized Heap (40 pts.)

Let us consider a generalized binary heap structure where every node has children. It is an almost complete, d-ary tree, and a node must be less than or equal to all its children. Design an array representation of the heap. Also design a **Deletemin** procedure for this data structure.

3. Hashing (10x3=30 pts.)

Let us assume you are implementing a hash table where your choices are between using a **Probing strategy** vs. **Chaining strategy**. Chaining strategy assumes a linked list that can hold as many records as needed. For both these strategies, you use the same function and hash table sizes.

(A) Which of the two strategies: Probing or Chaining will give you lower collisions. Justify your answer.

(B) One drawback of chaining is linear traversal when collision happens. Consider a small but significant number of collisions happen, would linear probing be more effective than chaining? Justify your answer.

(C) Reconsider part (B) under the assumption that you are using Quadratic probing instead of Linear probing as an alternative to Chaining. Justify your answer.