

1. (2 points) Honor Code

I promise that I will complete this quiz independently and will not use any electronic products or paper-based materials during the quiz, nor will I communicate with other students during this quiz.

I will not violate the Honor Code during this quiz.

☐ True ☐ False

2. (8 points) True or False

Determine whether the following statements are true or false.

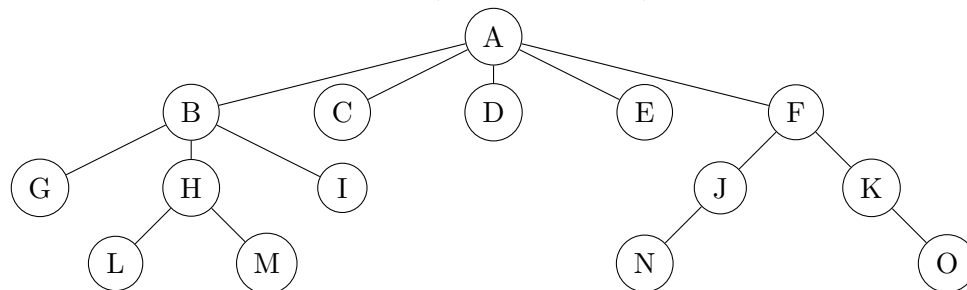
- (a) (1') A perfect binary tree always has height > 0 . ☐ True ☐ False
- (b) (1') The minimum height of a binary tree of n nodes is $\lfloor \log_2 n \rfloor$. ☐ True ☐ False
- (c) (1') If a binary tree of n nodes has height $\lfloor \log_2 n \rfloor$, then it is complete. ☐ True ☐ False
- (d) (1') Given the pre-order and post-order traversal sequences, we can draw only one unique binary tree. ☐ True ☐ False
- (e) (1') Every complete binary tree with height h ($h > 0$) has a perfect binary sub-tree with height $h - 1$. ☐ True ☐ False
- (f) (1') The degree and the depth of the root node are both zero in all trees. ☐ True ☐ False
- (g) (1') Let k is the maximum depth among all nodes, then the height of the tree is equal to $k - 1$. ☐ True ☐ False
- (h) (1') It's possible for a binary tree to have the same traversal sequences for BFS and DFS. ☐ True ☐ False

3. (10 points) Fill in the blanks

- (a) (2') If T is a tree with 999 vertices, then T has _____ edges.
- (b) (2') If T is a full binary tree with 50 leaves, its minimum height is _____.
- (c) (2') If T is a full binary tree of height h , then the minimum number of leaves in T is _____ and the maximum number of leaves in T is _____.
- (d) (2') Every full binary tree with 23 vertices has _____ internal vertices
- (e) (2') There are _____ distinct shapes of ordered binary trees with 5 nodes.

4. (10 points) Left-child Right-sibling binary tree

- (a) (4') Transform the tree below with root A (in N-ary format) to LCRS format.



(b) (3') Is the pre-order traversal of the original tree is identical to the pre-order traversal of the Knuth transform? If the pre-order traversal of the original tree is identical to the Knuth transform, write the common sequence. If not, write both sequences separately.

(c) (3') Is the post-order traversal of the original tree is identical to the post-order traversal of the Knuth transform? If the post-order traversal of the original tree is identical to the Knuth transform, write the common sequence. If not, write both sequences separately.