1: General Terminology

pints) The following are questions about terms used in our course.

Our course name is abbreviated to ADAA. What does ADAA stand for?

We have looked at ADTs and data structures to analyze run-time. What does ADT stand for?

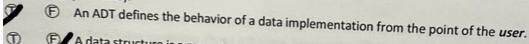
Abstract data type

Which Java IDE are we using for programming and homework submission?

What is your instructor's last name?

tion 2: Data

(4 points) The following are True/False questions about data in Computer Science. Mark either ① (for



(F) A data structure is a representation of the data (organization, storage, and management) 1 from the point of the programmer.

An ADT can have several data structures associated with it.

© An ADT is implementation-dependent.

(4 points) The following are questions about particular ADTs / data structures. Mark either ADT or DS

Hash Table List **Binary Search Tree** Stack

aps and Trees binary heap is a nearly complete binary tree filled on all levels except possibly the lowes e leaves are pushed left-most. Heaps are often implemented as an array. array A that implements a heap is usually of length power-of-two. If a heap has size 126 lements, what is the (minimum) size of the corresponding array? 2^log2 (126) Each node in a heap satisfies the heap property. What is the name of a heap in which every node's value is smaller than the values of its children? min heap If a binary heap contains 28 elements (nodes), what is the height of the corresponding binary log₂ 28 If a heap is implemented in an array A, and the maximum in that heap is the first element of d. Max heap

5. (4 points) A 2-3 tree is a tree in which each non-root node which is not a leaf has 2 or 3 sons. The following are True/False questions about 2-3 trees. Mark either ① (for True) or ⑥ (for False).

(4 points) A binary search tree (BST) is a linked-node based binary tree which stores key-value pairs (or just keys) in each node. Left and right children are roots of left and right subtrees, respectively. The following are True/False questions about BSTs. Mark either ① (for True) or ⑥ (for False).

All keys of nodes in the right subtree of a node N are smaller than the key of N.

Every path from the root to a leaf has length 2 or length 3.

Data is stored only in leaves. Data is ordered left-to-right.

The minimum key in a BST is in the root.

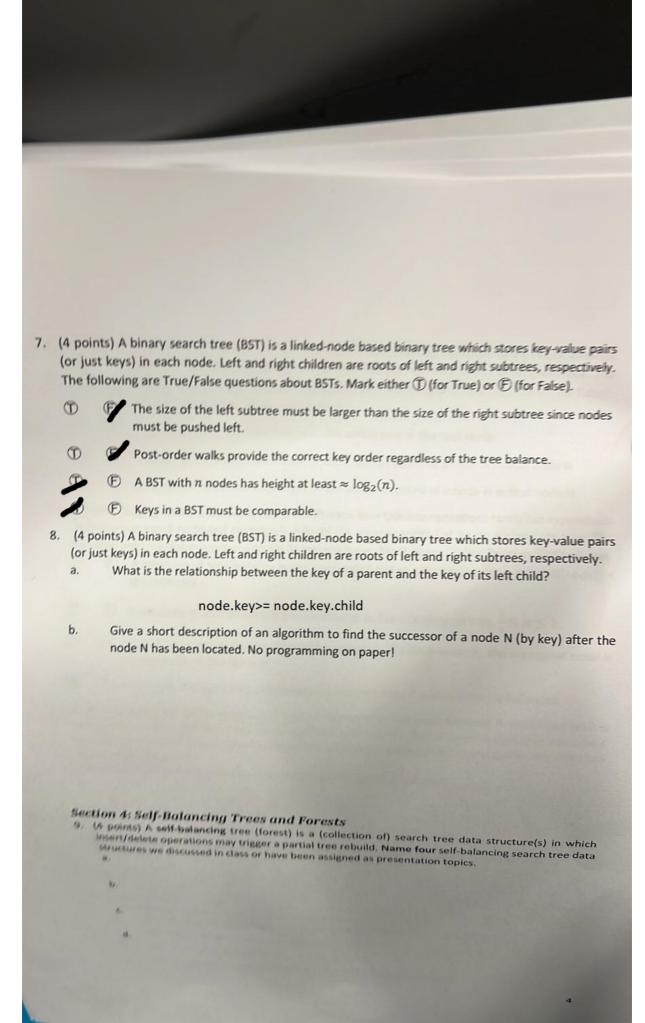
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Each node is labeled with the smallest value in the left subtree and the largest value in

3



10. (4 points) Scapegoat trees are search trees which upon insert/delete operations rarely but expensively choose a scapegoat node and completely rebuild the subtree rooted at it into a complete tree. The following are True/False questions about Scapegoat trees. Mark either 1 (for True) or F (for False). © Scapegoat trees are binary search trees. Scapegoat trees store the height of the whole tree in the root node. Scapegoat trees store the height of the subtree rooted at a node N in that node N. Scapegoat trees store the weight of the subtree rooted at a node N in that node N. 11. (4 points) Scapegoat trees are search trees which upon insert/delete operations rarely but expensively choose a scapegoat node and completely rebuild the subtree rooted at it into a complete tree. The following are True/False questions about Scapegoat trees. Mark either ① (for True) or ⑥ (for False). \bigcirc A measure of tree balance is the parameter α . For a Scapegoat tree, size(left[node]) \leq α -size(node). (F) A measure of tree balance is the parameter α . For a Scapegoat tree, $\frac{1}{2} \le \alpha \le 1$. (F) If a partial tree rebuild is triggered by insertion of a deep node N, the scapegoat node is an ancestor of the node N. \bigcirc If T is an α -weight-balanced binary search tree then T is also α -height-balanced. 12. (4 points) A priority queue is a special type of queue in which each element is associated with a priority value. Elements are served on the basis of their priority. Higher priority elements are served first. Elements with the same priority are served according to their order in the queue. Priorities can be encoded with keys. Name two algorithms or applications for which priority queues are used. a. b. Name two data structures that we looked at for implementation of a priority queue in class. C. d. 13. (4 points) Fibonacci heaps are a collection of trees. The following are True/False questions about The roots of the trees in a Fibonacci heap are stored in a doubly linked list. Fibonacci heaps consolidate trees after each DELETE_MIN operation. Node in a Fibonacci heap have parent pointers. A node N in a Fibonacci heap has pointers to each of its children.