ILLINOIS

Exam 1 Review

Practice Exam Q1

Question 1: List Runtime

In the worst case, the number of comparisons needed to search a singly linked list of length n for a given element is:

- (a) $O(\log \log n)$
- (b) $O(1)$
- (c) $O(\log n)$
- (d) $O(n)$
- (e) $O(n \log n)$

Practice Exam Q2

Question 2: List Implementation Runtime

Which of the following List ADT implementations gives us an O(1) time for `insertAtEnd`, i.e inserting an element at the end of the list?

I. A singly-linked list with only a `head` pointer.
II. A singly-linked list with `head` and `tail` pointers.
III. A doubly-linked list with only a `head` pointer.
IV. A doubly-linked list with `head` and `tail` pointers.

- (a) None of the other options is correct
- (b) I, II, III and IV
- (c) I and III
- (d) I, III and IV
- (e) II and IV

Practice Exam Q3

Question 3: Linked Lists

Consider a class **`List`** that is implemented using a **`singly linked list`** with each list node containing a **`next`** pointer. The **`List`** class also stores two pointers -- **`head`** and **`middle`**. The **`head`** pointer stores the first node in the list and the **`middle`** must always point to the node at the integer index `floor(length/2)`.

What is the best big O runtime to insert a new node at the head of this list? Explain your answer in the form of English sentences by first breaking down the function into steps and describing the Big O of each step. **Both your answer and your explanation will be graded.**

Practice Exam Q4