

1. Let  $P$  be a singly linked list. Let  $Q$  be the pointer to an arbitrary node  $x$  in the list. What is the tightest worst-case time complexity of the best known algorithm to delete the node  $x$  from the list, assuming that the list has sentinels?

- A.  $O(\log \log n)$
- B.  $O(n \log n)$
- C. [Your Answer]  $O(n)$
- D. [Correct Answer]  $O(1)$
- E.  $O(\log n)$

2. Consider the following function definition and suppose that 1) the node class consists of an integer data element, and a node pointer called next, and 2) variable head is the address of a linked list of such nodes.

What does the function do?

```
void fun(node * curr) {
    if (curr != NULL) {
        fun(curr->next);
        cout << curr->data;
    }
}

node * head = NULL;
// maybe insert data into the chain here
fun(head);
```

- A. fun segfaults on lists of odd length.
- B. None of the other options is correct.
- C. fun prints every other element of the list.
- D. [Your Answer] fun prints the elements of the list from head to the end.
- E. [Correct Answer] fun prints the reverse of the list.

3. In a sorted doubly linked list containing  $n$  nodes, the time taken to print out the 1st, 2nd, 4th, 8th, 16th, etc. elements is:

- A.  $O(n^2)$ .
- B. [Correct Answer] [Your Answer]  $O(n)$ .
- C.  $O(\log n)$ .
- D.  $O(1)$ .
- E.  $O(n \log n)$ .

4. Consider a class List that is implemented using a singly linked list with a head and tail pointer (i.e. pointers to the first and last nodes in the list).

Given that representation, which of the following operations could be implemented in  $O(1)$  time?

- I. Insert item at the front of the list
- II. Insert item at the rear of the list
- III. Delete front item from list
- IV. Delete rear item from list

- A. [Correct Answer] I, II and III
- B. [Your Answer] I and III
- C. I, II and IV
- D. All of them
- E. I and II

5. Which of the following List ADT implementations gives us an  $O(1)$  time for removeAtEnd, i.e removing an element from 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. I and III
- B. I, III and IV
- C. I, II, III and IV
- D. [Correct Answer] None of the other options is correct
- E. [Your Answer] II and IV