

1. Suppose we have implemented the Queue ADT as a singly-linked-list with head and tail pointers and no sentinels. Which of the following best describe the tightest running times for the functions enqueue and dequeue, assuming there are $O(n)$ items in the list, and that the rear of the queue is at the head of the list?

- A. $O(n)$ for both.
- B. **[Correct Answer]** $O(1)$ for enqueue and $O(n)$ for dequeue.
- C. None of the options is correct
- D. **[Your Answer]** $O(1)$ for both.
- E. $O(n)$ for enqueue and $O(1)$ for dequeue.

2. Consider this (and assume all STL classes are available):

```
struct animal {
    string name;
    string food;
    animal(string n="blob", string f="you"): name(n), food(f) { }
};

int main() {
    animal g("giraffe", "leaves"), b("bear");
    list<animal> zoo;
    zoo.push_back(g); zoo.push_back(b); //STL list insertAtEnd
    for(list<animal> *::iterator it = zoo.begin(); it != zoo.end(); it++)
        cout << (*it)->name << " " << (*it)->food << endl;
}
```

Which of the following describes the result when this function is compiled and run?

- A. There is a compiler error because of a type mismatch in the parameterized type for the list class.
- B. There is a runtime error because the iterator is dereferenced twice.
- C. There is a compiler error because there is no constructor matching the one called for variable b.
- D. **[Correct Answer]** **[Your Answer]** The code sends "giraffe leaves" and "bear you" to standard out.
- E. The code sends "giraffe leaves" to standard out.

3. Suppose `queue<int> q` contains 6 elements 1, 2, 3, 4, 5, 6 (enqueued in that order). What is the result of executing the following code snippet? (Assume member function `front()` returns the value found at the front of the queue without removing it.)

```
for(int i = 1; i < 7; i++){
    if(i%2==0) {
        q.enqueue(q.front());
        q.dequeue();
    }
}
```

- A. **[Correct Answer]** **[Your Answer]** The front half of the original `q` is now at the back half.
- B. The odd numbers in `q` are reversed.
- C. The elements `q` are reversed.
- D. `q` remains the same.
- E. The even numbers in `q` are reversed.

4. We have implemented the Stack ADT as an array. Every time the array is full, you resize the array creating a new array that can hold four times as many elements as the previous array and copy values over from the old array. What is the total running time for n pushes to the stack.

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

5. In implementing Queue ADT, using which of the following data structure gives best asymptotic runtime for enqueue? (Assume we require to enqueue at the end of the list or array)

- A. Singly linked list with head pointer only
- B. **[Correct Answer]** **[Your Answer]** Exactly two of the other options are correct
- C. Doubly linked list with head pointer only
- D. Singly linked list with head and tail pointer
- E. Doubly linked list with head and tail pointer only