uc3m

Systems Programming
(English group)

There is only one correct option for each question. Each correct answer adds 0.3 points. Each incorrect answer subtracts 0.1 points. Unanswered questions do not add or subtract points.

| Mark: | ⊠ | Cancel: | ▨ | Do not use: | ◯ | ✕ | ▨ |

- Mark the answer to each question with an "X" in the table below.

- If there is no "X" in a question or you mark more than one option, the question is considered unanswered.

- Complete **your personal information** before starting the exam.

| Name: | | Group: |

Signature:

NIA:

	A	B	C	D		A	B	C	D
1					6				
2					7				
3					8				
4					9				
5					10				

1.- What does the call *method(2,1)* return on the following recursive method?

```
public static int method(int i, int j) {
    if (j == 0) {
        return 1;
    } else if (j == i) {
        return 1;
    } else {
        return method(i - 1, j - 1) + method(i - 1, j);
    }
}
```

(a) ******* 2

(b) 1

(c) 0

(d) 3

2.- The following recursive method is an example of...

```
public static int method(int i, int j) {
    if (j == 0) {
        return 1;
    } else if (j == i) {
        return 1;
    } else {
        return method(i - 1, j - 1) + method(i - 1, j);
    }
}
```

(a) ******* Non-linear cascade recursion

(b) Linear non-tail recursion

(c) Linear tail recursion

(d) Non-linear nested recursion

3.- Given a linked list which contains objects of class *String*, assuming that the linked list is not empty and contains more than one element, what does the method *m()* return?

```
public Node<E> m() {
    Node<E> current = this.first;
    while(current != null) {
        current = current.getNext();
    }
    return current;
}
```
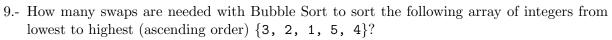
(a) ******* null

(b) A reference to the last node in the linked list

(c) A reference to the first node in the linked list

(d) A *NullPointerException*

4.- Which of the following methods in a *deque* (double-ended queue) could be used to implement the methods *push* and *pop* in a stack

(a) *** *insertFirst* for *push* and *removeFirst* for *pop*

(b) *insertFirst* for *push* and *removeLast* for *pop*

(c) *insertLast* for *push* and *removeFirst* for *pop*

(d) *removeFirst* for *push* and *removeLast* for *pop*

5.- Considering a `LinkedQueue<E>`, which is intended to be used to store *Integer* values and the implementation of the method *dequeue()* as shown below, with *top* a reference to the next node to be extracted in the queue, which of the following statements is correct?

```
public E dequeue(){
    E info;
    if (!isEmpty()) {
        info = top.getInfo();
        top = top.getNext();
        size--;
    } else {
        info = null;
    }
    return info;
}
```

(a) *** When the queue contains only one element the reference to the last element in the queue is not updated.

(b) The method dequeues on the incorrect side of the queue.

(c) If the queue is empty the method throws a *NullPointerException*.

(d) The information returned by the method *dequeue()* cannot be of type `E` as the queue is intended to be used to store *Integer* values.

6.- If we insert the following sequence of elements {`6,8,3,1,4,7,9`} one by one into a binary search tree (and of course in an ordered way), which of the following sequences represents the post-order traversal of the tree.

(a) *** 1,4,3,7,9,8,6.

(b) 1,3,4,6,7,8,9.

(c) 6,3,1,4,8,7,9.

(d) 1,4,3,9,7,6,8.

7.- If we insert the following sequence of elements {`5,7,6,8,3,1,2,4`} one by one into a binary search tree (and of course in an ordered way), which of the following statements on the three whose root is 3 is correct?

(a) *** Its size is 4.

(b) Its height is 3.

(c) It is a complete tree.

(d) The right child of 1 is 4.

8.- Given the min-heap represented by the following array {1,4,6,5,7}, what would the method `extract()` return if called just after calling the following two methods in the given order: `insert(3), extract()`

(a) *** 3

(b) 4

(c) 1

(d) 5

9.- How many swaps are needed with Bubble Sort to sort the following array of integers from lowest to highest (ascending order) {3, 2, 1, 5, 4}?

(a) *** 4

(b) 3

(c) 2

(d) 5

10.- Which of the following sorting algorithms needs more memory space to sort an array of one million objects of class *String*?

(a) *** Merge Sort

(b) Quick Sort

(c) Heap Sort

(d) Objects of class *String* cannot be sorted