NAME:
SURNAME:
NIA:
GROUP:

2nd Part: Problems(5 points out of 10)

Duration: 120 minutes
Maximum grade: 5 points
Date: 3rd of June, 2013

- Books, written notes, texts, or switched on electronic devices are not allowed in the examination room. Candidates contravening this may be required to withdraw from the examination room
- Fill in your personal data at the beginning of this sheet before starting the exam
- Use the empty boxed spaces after each question to write your answers

PROBLEM1 (2.5 points)

Let `Message`be a class that represents a message in a messaging system (the dots bellow substitute already coded methods, which you can use in your answer, but whose details are not shown here for brevity):

```
public abstract class Message {
private String text;
private Person from;
private Person to;
privateint priority;

public Message(String text, Person from, Person to, int priority) {...}
public String getText() {...}
public Person getFrom() {...}
public Person getTo() {...}
publicintgetPriority() {...}
public void dispatch() {...}       // sends the message
public void archive() {...}        // stores the message
public abstract String format();   // formats the message as a String
}
```

There are no more methods or attributes in this class and you are not allowed to modify them.
Continue reading on the next page.

Question 1 (0.75 points)

Write the code of the class `Answer`, with all itsneeded methods and attributes. This class inherits from `Message`and represents an answer to a message.Be mindful of:

- The arguments of its constructor must be: the text of the answer and the original message it is responding to.The attributes`from`and`to`will be the taken from the `to`and`from`of the original message. The priority of the answer must be the same as the priority of the original message.
- The `format`method must return the concatenation of: (1) the`format`'s return value of the original message, between square brackets; (2) a blank space character; (3) the text of the answer.

```
public class Answer extends Message {

    private Message original;

    public Answer(String text, Message original) {
        super(text, original.getTo(), original.getFrom(), original.getPriority());
        this.original = original;
    }

    public String format() {
        return "[" + original.format() + "] " + getText();
    }

}
```

Question 2 (1 point)

Write the code for the class`Question`, with all its needed methods and attributes.This class inherits from `Message`and represents a message with a question. Be mindful of:

- It must have a constructor with the same arguments as the `Message`'s constructor.
- The `format`method will just return the `text` of the message.
- You are not supposed to store`Question`s without an answer. Therefore, you should override the `archive`method so it won't do anything.
- It has an `Answer reply(String text)` method that instantiate an answer message for the current question, using its argument as the answer's text. This method must also store the current question by calling the `archive` method inherited from the`Message` class (This is, don't use the overridden method in the `Question` class, but the one on `Message`).

```
public class Question extends Message {

    public Question(String text, Person from, Person to, int priority) {
        super(text, from, to, priority);
    }

    public void archive() {
        // questions cannot be archived without answering them
    }

    public Answer reply(String text) {
        Answer answer = new Answer(text, this);
        super.archive();
        return answer;
    }

    public String format() {
        return getText();
    }

}
```

Question 3 (0.75 points)

There will be a simple graphical user interface for filling in answers to questions.Given a question to user, it will record her answer and create an `Answer` object.

The GUI will show a text box and two buttons (labeled as "Accept" and "Cancel"). Pressing the accept button will create the `Answer` object using the text from the text box and send it.

Whatever the button pressed, the text box must be emptied.

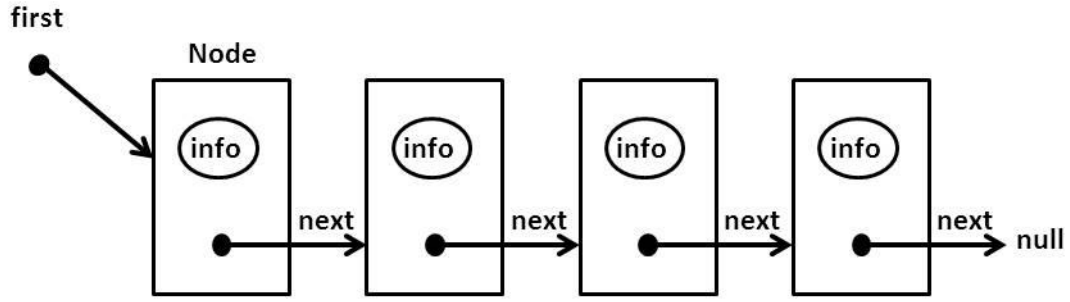
The GUI will be coded as a single class, which will work as the main window and its own event listener from the buttons.

Fill in the underscored blanks bellow to answer this question.

```
public class GraphicalInterface extends ___JFrame___
                                implements ___ActionListener___ {
    private Message original;
    private JTextArea textArea;

    public GraphicalInterface(Message original) {
        this.original = original;

        getContentPane().___setLayout___(new FlowLayout());
        JButtonacceptButton = new JButton("Accept");
        JButtoncancelButton = new JButton("Cancel");
        textArea = new JTextArea(10, 40);

        getContentPane().add(___textArea___);

        getContentPane().add(___acceptButton___);

        getContentPane().add(___cancelButton___);

        acceptButton.addActionListener(___this___);

        cancelButton.addActionListener(___this___);

        pack();
        setVisible(___true___);
    }

    public ___void actionPerformed(ActionEvent e)___ {
        String text = textArea.getText();
        textArea.setText("");
        if (e.getActionCommand().equals("Accept")) {
            Message answer = new Answer(text, original);
            answer.send();
        }
    }

}
```

PROBLEM2 (2.5 points)

Let `Queue` be a queue implemented as a linked list (`LinkedList`), as the one shown below:




```
public class Node {

  public Object info;
  public Node next;

  public Node(){...}
  public Node(Object info,Node next) {...}

}
```

```
public class LinkedList {

      public Node first;
      public int size = 0;

      public LinkedList (){...}


}
```

Continue reading on the next page.

Question 1 (0.75 points)

Write the code for the following method of the `LinkedList`class:

- `public void insertAt(Object data, int position)`

It will insert a datum (`data`) in the position just after `position`, updating `size`.

NOTES: *Positions in the list start at 1. If `position` is less or equal than 0 the insertion must be made at the beginning of the list. If `position` is greater or equal than `size` the insertion will be made at the end of the list.*

```
/*
 * NOTE: in the exam it was clarified that getters and setters could be used for the Node class.
 */

public void insertAt(Object data, int position) {
    if ((first == null) || position <= 0) {
        Node tmp = new Node(data, first);
        first = tmp;
    } else {
        Node aux = first;
        for (int i = 1; i < position && aux.getNext() != null; i++) {
            aux = aux.getNext();
        }
        Node tmp = new Node(data, aux.getNext());
        aux.setNext(tmp);
    }
    size++;
}
```

Question 2 (0.75 points)

Modify the `LinkedList` declaration so it implements the `Queue` interface defined here:

```
public interface Queue {
        public void enqueue(Object o);
        publicbooleanisEmpty();
        publicint size();
}
```

You must write the code for these 3 methods.

NOTES: *Here we are ignoring the `dequeue` method to simplify the problem, you must do the same. You can reuse the `insertAt` method from the previous question to implement the `enqueue` method, whether you answer that question or not.*

```
public class LinkedList implements Queue {

    (...)

    public void enqueue(Object info) {
        insertAt(info, size);
    }

    public boolean isEmpty(){
        return (first == null);
    }

    public int size() {
        return size;
    }
}
```

Question 3 (1 point)

Write the code for the new method `public Queue invert()` of the `LinkedList` class, which will return a new queue instance, with all the elements in the linked list, *in reverse order*.

NOTES: *You can use the following `stack` class as a help and suppose all its methods are already implemented:*

Constructor Summary	
`Stack``()` Creates an empty Stack.	

Method Summary	
`boolean`	**`empty`**`()` Tests if this stack is empty.
`Object`	**`pop`**`()` Removes the object at the top of this stack and returns that object as the value of this method.
`Object`	**`push`**`(Object item)` Pushes an item onto the top of this stack.

```
public Queue invert() {
    Stack stack = new Stack();
    Queue queue = new LinkedList();
    Node aux = first;
    while (aux != null) {
        stack.push(aux.getInfo());
        aux = aux.getNext();
    }
    while (!stack.isEmpty()) {
        queue.enqueue(stack.pop());
    }
    return queue;
}
```