Programming Languages and Techniques

Final - 2 hrs

Make sure to write down any assumptions you make. Please feel free to use the back of the answer booklet to continue (or begin) solutions. Always put down a question number for it.

Write your name and your email on this first page.

There are 15 questions in total.
Questions.

1. You are given the following code that represents Complex numbers.

```java
class Complex{
    Double realPart;
    Double imaginaryPart;

    public Complex(Double realPart, Double imaginaryPart){
        this.realPart = realPart;
        this.imaginaryPart = imaginaryPart;
    }

    public add(Complex c){
        this.realPart += c.realPart;
        this.imaginaryPart += c.imaginaryPart;
    }
}
```

Write the equals method for this class.

( 2 pts)
2. How does one pause the execution of a program for 5 seconds. Write a single line of code for this. (1 pt)

3. Sketch out what the UI will look like after the running of the following code. This does not need to look perfect, but the relative arrangements do matter. (3 pts)

```java
frame = new JFrame("frame this!");
frame.setLayout(new FlowLayout());
panel1 = new JPanel();
panel1.setLayout(new BorderLayout());
button1 = new JButton("first");
button2 = new JButton("second");
panel2 = new JPanel();
panel2.setLayout(new GridLayout(1,3));
button3 = new JButton("1");
button4 = new JButton("3");
button5 = new JButton("2");

panel1.add(button1, BorderLayout.NORTH);
panel1.add(button2, BorderLayout.EAST);
panel2.add(button3);
panel2.add(button4);
panel2.add(button5);

frame.add(panel1);
frame.add(panel2);

frame.pack();
frame.setSize(1024,768);
frame.setVisible(true);
```
4. If a class extends Observable, what are the two lines of code needed in order to inform the Observer that something has happened and it needs to run its update method? (1 pt)

5. Who was your best partner this semester? If you do not remember the name, please name the assignment (we do not need a number, just the description like Calculator will be fine). (1 pt)

6. Who was your worst partner this semester? Same instructions as above if you do not remember the name. Also, these are 2 free points, so do not leave this blank! (1 pt)
7. Find the bugs in the following programs. A bug is something that Eclipse will point out with a red squiggly or something that has unintentional consequences. Please explain what the bug is (a word/short sentence is sufficient) and then write out the fix. Some of the fixes are a small change while some would require potentially writing more code. (7 pts)

```java
public static void main(String[] args) {
    FileReader fileReader = new FileReader("finalExam.txt");
}
```

```java
int x = 45;
int y = 5;
if (x == 2) & (y == 5) {
    System.out.println("x is two and y is five");
}
```
public class DoSomething implements Runnable {

    public void start() {
        for (int i = 0; i < 10; i++) {
            System.out.println("i am here");
        }
    }
}

public static void main(String[] args) {
    ArrayList<String> myList = new ArrayList<String>();

    myList.add("ar");
    myList.add("bh");
    myList.add("us");
    myList.add("nu");
    myList.add("rm");

    Iterator<String> it = myList.iterator();
    while (it.hasNext()) {
        String value = it.next();
        if (value.equals("bh"))
            myList.remove(value);
    }
}
9. Why are abstract classes useful? Can everything that we do with interfaces be done by declaring abstract classes instead? Give us an example of an inbuilt abstract class in Java and an inbuilt interface in Java. (4 pts)

10. When saving a java project as an executable, what file format is this executable stored as? (1 pt)

11. What is the output of the following code? Show your working to get partial credit. (4 pts)

```java
public static void main(String[] args) {
    int n1 = 2435;
    int n2 = 0;
    int temp = 0;
    while(n1 > 0){
        temp = ++n1%10;
        n2 = n2++ * 10 + temp;
        n1 = n1/10;
    }
    System.out.println(n1 + n2 + " Crazy number is " + n1 + n1);
}
```
12. True or False (10 pts)

- For a string variable s, the comparison (s == null) and (s == "") are effectively doing the same thing.
- Integer.parseInt("5") is an example usage of a static method.
- int x = 5; and Integer x = 5; mean the same thing.
- Every class has to have a parameter less constructor.
- A class can implement multiple interfaces.
- Every class has to have a name.
- The regular expression ‘[a-z]+[0-9]*\slanding’ will match the string ‘apollo11 landing’.
- When using MVC, the model should depend on the view.
- In pair programming it is best to code silently.
- A variable in a final class cannot be modified.
13. In each of the following, write a few Java statements to perform the required task. Do not write complete classes or complete methods. (10 pts)

(a) Set a boolean variable x to be true if the string s begins with the letter y and to false otherwise.

(b) Given a string whose length is even, extract the two characters (in the form of a string) that are in the middle. For a word like ”computer” we want to extract ”pu”.

(c) A variable namePhoneMapping that is intended to provide information about people’s phone nums is declared to be of type HashMap<String, Integer>. Using just one additional variable, loop through the mapping and print every phone number on a separate line. Print just the phone number.

(d) Print true if a variable myButton is an instance of the CalculatorButton class and print false otherwise.
(e) Check to see if an English word begins with an ‘a’, ends with a ‘t’ and has the word ‘man’ within it. (the word adamant would be a word that satisfies the condition).

14. Name 2 JUnit methods other than assertEquals and specify what type of arguments each one expects. (2 pts)

15. Suppose we want to create a TimerTask that print out ”Hello World!” every x seconds. We do this by defining a class called SayHello. Write out this class in its entirety. (3 pts)