TE WHARE WĀNANGA O TE ŪPOKO O TE IKA A MĀUI

VICTORIA
UNIVERSITY OF WELLINGTON

EXAMINATIONS – 2015
TRIMESTER 2

COMP 102
INTRODUCTION TO
COMPUTER PROGRAM
DESIGN

Time Allowed: TWO HOURS

CLOSED BOOK

Permitted materials: Silent non-programmable calculators or silent programmable calculators with their memories cleared are permitted in this examination.

Printed foreign language to English dictionaries are permitted.

No other material is permitted.

Instructions: Attempt ALL Questions.

The exam will be marked out of 120 marks.

Brief Java Documentation will be provided with the exam script

Answer in the appropriate boxes if possible — if you write your answer elsewhere, make it clear where your answer can be found.

There are spare pages for your working and your answers in this exam, but you may ask for additional paper if you need it.

Questions

	Marks
1. If, while and call method	[10]
2. Files	[20]
3. Defining class and interface	[18]
4. Arrays and 2D arrays	[32]
5. ArrayLists of Objects	[40]

SPARE PAGE FOR EXTRA ANSWERS

Cross out rough working that you do not want marked.
Specify the question number for work that you do want marked.

Question 1. if, while, call method [10 marks]

(a) [5 marks] The testIt method below has one parameter.

```
public void testIt ( int x){

    if  ( x > 8 ) {
        UI. print ("Good ");
    }
    else {
        UI. print ("Better ");
    }
    while(x > 8){
        UI. print (x + "  " );
        x = x−2;
    }
}
```

What would the following calls to testIt print out?

```
testIt(15);   ⟹



testIt(6); ⟹


```

(Question 1 continued)

(b) [5 marks] What will be printed out to the text pane by executing the following method1?

```
public void method1(){
    this.method2(2, 3);
    int x = 1;
    int y = 2;
    this.method2(x, y);
    this.method2(y, x);
    UI. println ("x = " + x);
}
public void method2(int x, int y){
    x = x+2*y;
    UI. println (x);
}
```

Question 2. Files [20 marks]

Suppose an example text file contains the following:

```
Comp102 2015 T2
First contact person is Sharon. Her email address is xgao@ecs.vuw.ac.nz
Email bugs@ecs.vuw.ac.nz for computer problems.
For private tutoring, email Zarinah.Amin@vuw.ac.nz to get tutor names.
```

(a) [8 marks] What will the following printData method print out if called with the name of the file above?

```java
public void printData(String fileName){
    try{
        Scanner sc = new Scanner(new File(fileName));
        if (sc.hasNextInt()){
            UI.println(sc.nextInt());
        }else {
            sc.next();
        }
        if (sc.hasNext()){
            UI.println(sc.nextLine());
        }
        UI.println("------------------");
        if (sc.next().length() > 3){
            sc.next();
            UI.println(sc.next());
        }
        sc.close();
    } catch(IOException e){UI.println("file reading failed"+e);}
}
```

Write your answer here:

```
 2015 T2
------------------
person
```

SPARE PAGE FOR EXTRA ANSWERS

Cross out rough working that you do not want marked.
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(Question 2 continued)

(b) [12 marks] Complete the following findEmail method, whose parameter is the name of a file. You may assume the file has many lines and there are many email addresses which can appear anywhere in the file. You should assume an email address is a token with "@" and ".", and is more than 12 characters long.

For example, if **data.txt** is the name of the file on the previous page, findEmail("data.txt") should print out

```
xgao@ecs.vuw.ac.nz
bugs@ecs.vuw.ac.nz
Zarinah.Amin@vuw.ac.nz
```

Please note that the next method in the Scanner class will read in a token. A token is any String separated by space or tabs, and an email address can be read in as one token.

---

public void findEmail(*String* filename){
   try{

   } **catch**(IOException e){UI.println("`file reading failed`"+e);}
}

Question 3. Defining a class and an interface [18 marks]

(a) [12 marks] Complete the Balloon class on the opposite page.

A Balloon object should contain fields to store its location (the x, y coordinates of the center of an oval), color and size (the width of the oval). Each balloon object may have different location and color, but all have the same initial size of 20.

The Balloon class should have a constant to store the maximum size (maximum width of the oval) of a balloon which is 100.

Balloon should have a constructor that initializes its location and color, and draws the balloon at the specified position with the specified color using a default initial size of 20.

Balloon have four methods: draw and erase are given to you, and your task is to complete the following two methods:

- blow, which has an integer parameter. The method should erase the old balloon, increase its size by adding the specified value, and draw a new one with a bigger size. Make sure that the size does not go over the maximum size defined in the constant.

- moveTo, which has two parameters to specify the x y coordinates of the new location. This method should erase the old balloon, change its location and draw it at the new location.

(Question 3 continued)

```java
public class Balloon {




    public Balloon(double startX,  double startY,  Color c){







    }
    public void blow(int n){







    }
    public void moveTo(double newX, double newY){








    }
    public void draw(){
        UI.setColor(this.col );
        UI. fillOval (this.x−this.size/2, this.y−this.size*1.2/2,
                                this.size,  this.size *1.2);
    }
    public void erase(){
        UI.eraseOval(this.x−this.size/2, this.y−this.size*1.2/2,
                                this.size,  this.size *1.2);
    }
}
```

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Cross out rough working that you do not want marked.
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(Question 3 continued)

(b) [6 marks] Suppose you are writing a game that involves many blow up toys that are similar to Balloon, for example Fish, Cat, LongBalloon, Bomb etc. They have the same default maximum size, but each of them may have a different color, location, and size. Also each of them should have at least four methods draw, erase, blow, moveTo and these methods have the same parameters as the ones for Balloon, but their body can be different, for example, Fish will be drawn differently.

Complete the following BlowUpToy interface, so that all these blow up toys including Balloon can implement this interface. Then all these blow up toy objects can be saved in an ArrayList of BlowUpToy, e.g.

ArrayList<BlowUpToy> toys = **new** *ArrayList*<BlowUpToy>();

```
interface BlowUpToy{




}
```

Question 4. Arrays and 2D Arrays [32 marks]

(a) [7 marks] Consider the following printArray method which is passed an array of Strings.

```
public void printArray(String[] names){

    names[0]= names[3];
    names[3] = "Auckland";
    UI. println (names[0]);
    UI. println (names[3]);
    UI. println (names[2]+"-"+names[1]);

    for ( int  i  = names.length−1; i >= 0; i = i−1){
            UI. println (names[i]);
    }
```

What will the printArray method print out if passed the following array?

Otago	Napier	Taupo	Dunedin	Nelson
0	1	2	3	4

(Question 4 continued)

(b) [9 marks] Complete the following printPositive method which is passed an array of numbers. This method should print to the UI text pane all the positive numbers (excluding zero), one number per line, and also count the positive numbers and print the count result at the end.

```
public void printPositive ( int [ ] nums){







































}
```
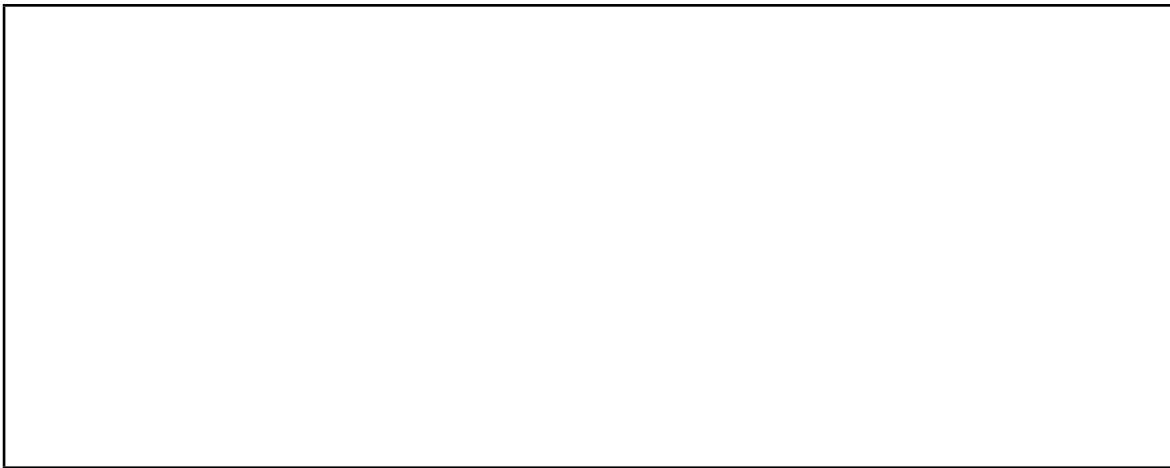
(Question 4 continued)

(c) [7 marks] What will the following print2DArray method print out?

```
public void print2DArray(){
    int [ ][ ] nums = new int[ ][ ]{{3, 7, 8},
                                    {6, 4, 9},
                                    {0, 1, 2}};
    UI. println (nums[1][1]);
    UI. println (nums[2][0]);

    for( int  i  = 0;  i  < nums.length; i++){
      UI. println (nums[0][i ]);
    }
}
```

(Question 4 continued)

(d) [9 marks] Complete the following allInRange method which is passed a 2D array of double numbers. This method should return true if all the numbers are in the range [0, 100]. If there are any numbers that are smaller than 0 or bigger than 100, it should return false.

```java
public boolean allInRange(double[ ][ ] nums){



















}
```

Question 5. ArrayLists of Objects [40 marks]

This question concerns a program for managing a database of books posted on a web site. The program displays a list of books to users and users can vote "like" or "dislike" and these votes are stored in the Book objects. Two of the classes in the program are a Book class and a BookApp class.

The Book class below defines Book objects, which store the book title, price and the number of like votes and dislike votes. Note that this class is similar to the Book class used in the term test, but this one has more methods.

```java
class Book{
    private String description;
    private double price;
    private int likes = 0;
    private int dislikes = 0;

    public Book(String d, double p){
        this.description = d;
        this.price = p;
    }

    public void like (){
        this.likes++;
        UI.println(this.description + " Thumb up");
    }
    public void dislike (){
        this.dislikes++;
        UI.println(this.description + " Thumb down");
    }
    public int getLikes() {
        return this.likes;
    }
    public int getDislikes() {
        return this.dislikes;
    }
    public boolean recommend(){
        return (this.likes > this.dislikes);
    }
    public void putOnSale(double d){
        this.price = this.price * d;
        UI.println(this.description + " special price: " + this.price);
    }
    public String toString(){
        return (this.description + " ups:" + this.likes + " downs: " + this.dislikes);
    }
}
```

(Question 5 continued)

The BookApp class defines a field to store the database of Book objects, and several methods, including testBooks, addNewAndDisplay, recommend5forSale and topRated3.

private *ArrayList*<Book> books = **new** *ArrayList*<Book>();

Assume that books will never contain any null values.

(a) [8 marks] What will the following testBooks method print out?

```
public void testBooks() {
    Book a = new Book("Java", 100);
    Book b = new Book("C++", 120);
    a. like ();
    b. dislike ();
    b. dislike ();
    UI. println ("-------------");
    UI. println (a.toString ());
    UI. println ("------------");
    UI. println (b);
    UI. println ("------------");
    books.add(a);
    books.add(b);
    books.add(new Book("Haskell", 80));
    UI. println (books.get(0).getLikes ());
    UI. println ("------------");
    UI. println (books.get(1).getDislikes ());
    UI. println ("------------");
    UI. println (books.get(2));
}
```

SPARE PAGE FOR EXTRA ANSWERS

Cross out rough working that you do not want marked.
Specify the question number for work that you do want marked.

(Question 5 continued)

(b) [8 marks] Complete the following addNewAndDisplay method that makes a new Book object using the title and price given in the parameters, and adds it to the database. This method should add the book at the end of the list, and then display all books in the list.

```
public void addNewAndDisplay(String title, double price){




















}
```

SPARE PAGE FOR EXTRA ANSWERS

Cross out rough working that you do not want marked.
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(Question 5 continued)

(c) [10 marks] Suppose there are many books in the list and the books have got many like and dislike votes from users. Complete the following Recommend5forSale method that finds the first five recommended books and put them on sale at a 70% off discount price.

Please note that the recommend and putOnSale method are defined in the Book class. You should call these methods for this question.

If there are fewer than five recommended books in the database, then put all recommended ones on sale.

```
public void recommend5ForSale() {




















}
```

SPARE PAGE FOR EXTRA ANSWERS

Cross out rough working that you do not want marked.
Specify the question number for work that you do want marked.

(Question 5 continued)

(d) [14 marks] Complete the following topRated3 method to display the top three rated books in the order of their rates. You can rate a book by the differences between its likes and dislikes.

rate = Number of likes - Number of dislikes

Two books with the same rate can be ordered in either way.

public void topRated3(){

}

* * * * * * * * * * * * * *