

15-111 Advanced Programming
Exam 1 (100 points)
SOLUTION

Name: _____ Section: _____

This a closed book exam. All vector methods will be given. If you need an additional method, please ask. Good Luck!!!

Part I - Circle the best answer for the following questions (40%)

1. The most time consuming stage of software development is
a. coding b. code review c. compiling **d. testing and debugging**
2. The most expensive component of modern computing is
a. **Software** b. hardware
3. Coding is low priority compared to design
a. **TRUE** b. FALSE
4. In object oriented programming data is
a. **Primary** b. secondary
5. The notion of combining state and methods in an object is called
a. inheritance **b. encapsulation** c. interface d. none of the above
6. An object is a class instance
a. **TRUE** b. FALSE
7. A class is a _____ for objects
a. instance **b. blue-print** c. method
8. Package is a collection of ____
a. **related classes** b. related methods c. related variables
9. The key word "extends" refer to the notion of
a. class defintion **b. inheritance** c. state of an object
10. The relationship "is-a" is
a. **inheritance** b. recursion c. class containment
11. Which one of the following is not a primitive data type
a. int **b. bool** c. float d. char
12. Public members of a class are:
a. Accessible only by the class members
b. **Accessible by all outside objects**
13. Objects are _____ from classes
a. declared **b. constructed**
14. Which one of the following is not a primitive data type
a. int b. **class** c. char d. boolean

15. The following is valid code: `final int x = 2; x = x + 1;`

- a. TRUE **b. FALSE**

16. A difference between private and protected member of a class makes sense when we are dealing with

- a. Defining new members of a class **b. using inheritance to create new classes**
c. when we want to protect private members from changes

17. An array size can be changed at run time

- a. TRUE **b. FALSE**

18. In the declaration `int [] A, B;`

- a. only A is an array b. only B is an array **c. both A and B are arrays**

19. Which one of the following is NOT a proper method name?

- a. `goForward()` b. `jumpUp()` c. **`TurnAround()`** d. `goBack()`

20. Class interface

- a. provide all class method details **b. provide a quick glance at class methods**

Part II - WRITE NEW METHODS (30%)

1. Study the class definition of matrix

```
public class Matrix
{
    public Matrix() {}        // unallocated vectors
    public Matrix(int n, int m); // dimensions given
    public Matrix(int n, int m, final int fillValue);
        // and default fill value
    private int NumRows ;
    private int NumColumns ;
    public int final getRows();
    public int final getColumns();
    public void SetDimensions(int r, int c);
};
```

- a. Name all accessors

public int final getRows();

public int final getColumns();

name all mutators

public void SetDimensions(int r, int c);

- b.

c. name all constructors?

```
public Matrix() {} // unallocated vectors
public Matrix(int n, int m); // dimensions given
public Matrix(int n, int m, final int fillValue);
```

d. Show Three different ways of creating a matrix.

```
Matrix M1 = new Matrix();
Matrix M2 = new Matrix(2,3);
Matrix M3 = new Matrix(2,3,1);
```

Using the available methods only, write new methods:

e. A boolean method to return true if the matrix is square.

```
public boolean isSquare(){
    return ( numRows == numColumns);
}
```

f. Write a boolean method that returns true if the matrix is symmetric (i.e $M[i][j]=M[j][i]$)

```
public void isSymmetric() {
    for (int I=0; I<numRows; I++)
        for (int j=0; j<numColumns; j++)
            if (mat[I][j] != mat[j][I]) return false;
    return true;
}
```

g. Write a complete method that will return the sum of the diagonal elements of a matrix, if it is square.

```
public int diagonalSum() {
    if (isSquare())
        { int sum=0;
          for (int I=0; I<numRows;I++) sum += mat[I][I];
          return sum;
        }
    else return -999;
}
```

. Consider the following class definition

```
public class PersonDB {  
    private Vector L=new Vector();  
    public PersonDB(){ }  
    public boolean searchDB(OnePerson P){ }  
    public boolean moveToBack(OnePerson P){ }  
    public boolean moveToFront(OnePerson P){ }  
};
```

a. Complete the methods moveToBack(). Method should return false , if object P is not in the list.

```
public boolean moveToBack(OnePerson P){  
    if (searchDB(P))  
        { int I = L.indexOf(P);  
          L.remove(i);  
          L.addElement(P);  
        }  
    else return false;  
}
```

b. Complete the methods moveToFront(). Method should return false , if object P is not in the list.

```
public boolean moveToFront(OnePerson P){  
    if (searchDB(P))  
        { int I = L.indexOf(P);  
          L.remove(i);  
          L.insertElementAt(P,0);  
        }  
    else return false;  
}
```

Part III - TRACE THE CODE (20%)

1. Assume that list is a vector. What is the purpose of the following code

```
for (int I=0; I<list.size()/2;I++)  
    { int temp = list[I];  
      list[I] = list[list.size()-I-1];  
      list[list.size()-I-1]=temp;  
    }
```

This code reverses an array

2. Consider the following code

```
int I = ???  
if (I < 1) { task1();}  
else if (I > 3)  
    { task2();}
```

```
else  
  { task3();}
```

Find value of I such that

- a. task1 is executed - **I = 0 (anything less than 1)**
- b. task2 is executed – **anything greater to 3 (eg: 4)**
- c. task3 is executed - **anything greater or equal to 1 but less or equal to 3 (eg: 3)**

Part IV - FIND SYNTAX/LOGIC ERRORS (10%)

1. find all syntax errors in the following code. Write the corrections to the right of code

```
Int I = 0 // missing ; I capital  
while (I < 1) ; // no semicolon  
{  if I > 2 // no ( )  
    { I = I + 2 } // no semicolon  
I = I + 1; // ok
```

2. Find the unreachable statement(if any) in the following code.

```
if (I < 1)  
  task1();  
else if (I < 0) task2(); else task3();
```

if I < 0 then I < 1 and therefore task2 is never reached