THE UNIVERSITY OF ZAMBIA
School of Natural Sciences
Department of Computer Studies

COMPUTER PROGRAMMING
CSC 2000

2013-2014 FINAL EXAM

Date: 18TH July 2014
Venue: API
Time: 09:00hrs – 12:00hrs
Duration: 3 Hours

Instructions

1. This exam has two (2) sections
2. Answer all questions in section A
3. Section B has three three(3) questions, answer any two (2) questions

SECTION A [50 Marks]

Answer all questions in this section

1. Read the java code below and answer the questions that follows [10 Marks]

```
public class DataStore{
   private int[] data;
   private static final int SIZE = 5;
   private int n;
   private int d;

  public DataStore(){
    data = new int[SIZE];
    n = 2;
    d = 7;
  }

  public void printData(){
       System.out.print(data[0]);
       for(int index=1; index<SIZE; index = index +2){
         System.out.print(", " + data[index]);
       }
      System.out.println();
  }

 public boolean setValue(int pos, int val){
    if(pos<SIZE){
      data[pos] = val;
      return true;
    }else
       return false;
  }

  public void store(){
   setValue(n, d);
  }
 public static void main(String args[]){
      DataStore ds = new DataStore();
  }
}//end class DataStore
```

0, 1, 2, 3, 4

a) Identify all the errors in the above code. [2 marks]
b) What value is returned by calling setValue(4, 8)? [2 Marks]
c) What value is returned by calling setValue(5, 12)? [2 Marks]
d) What are the values of n and d after invoking store()? [2 marks]
e) What is the output after calling printData() if an array is initialized to {3,7,9,9,0} [2 Marks]

2. Explain the meaning of the following keywords to java. [5 Marks]
   a) instanceof
   b) final
   c) abstract
   d) return
   e) synchronized

3. Analyze the java code below and answer the questions that follows [8 Marks]

```
public class C {
  public int x;
  public C(int i) {
    x = i;
  }
}//end class C

public class E {
  public static void main(String data[]) {
    C ar[] = new C(2);
    ar[0] = new C(1);
    ar[1] = new C(2);
    ar[2] = new C(4);
    System.out.println(ar[0].x + ar[1].x * ar[2].x);
  }
}//end class E
```

   a) Identify all the errors the above code will produce [2 marks]
   b) What will be the output if all errors are fixed? [2 Marks]
   c) Rewrite class E by using HashMap class to achieve the same results as in b) above [4 Marks]

4. Read a piece of java code below and answer the questions that follows [10 Marks]

```
for(int i=0; i<4; i++){
  for(int j=0; j<=i; j++){
    System.out.print("*");
  }
  System.out.println();
}
```

   a) Will the above piece of code compile? [1 Mark]
   b) What will be the output of the above code? [3]
   c) Rewrite the above piece of code using while loops. [3 marks]
   d) Explain the following terms; [3 Marks]
      i) Syntax Error
      ii) Logic Error
      iii) Runtime Error

5. Answer the following questions [7 Marks]
   i. What is the difference between a primitive type and a reference type?
   ii. What is a java keyword?

iii. What is a java identifier?
iv. Explain the rule for forming java identifiers
v. What are white spaces in java and why are they important?
vi. What are escape sequence characters?
vii. List three (3) types of comments we have in java

6. Consider the following method [2 Marks]

```
public void myfunc()
{
  static int a = 20;
  System.out.println(a++);
}
```

What is the value printed when myfunc() is called?

7. Analyze the java code below and answer the questions that follows; [8 Marks]

```
public interface A{
    private int number = 3;
    protected void do(){
      System.out.println("Printing from A");
    }
    void printNumber();
}//end interface A

public class B extends B{
    public void do(){
       System.out.println("Printing from a B");
    }
    public void printNumber(){
      System.out.println(number);
    }
    public static void main(String args[]){
        A a1 = new A();
        A a2 = new B();
        a2.do();
        a2.printNumber();
    }
}
```

a) What is a java interface? [1 Mark]
b) Identify all errors in the above code. [4 Marks]
c) Rewrite the above code with errors removed. [3 Marks]

SECTION B [50 Marks]

Answer any two (2) questions in this section

1. Write a program in Java to find out if a number is prime. A number is called prime if it is divisible by either itself or 1. Use the Graphical User Interface (GUI) both for getting input from the user and displaying the output to the user. [25 Marks]

2. Implement an abstract class named Person and two subclasses named Student and Employee in Java. A person has a name, address, phone number and e-mail address. A person can do the following; walk and speak. A student has a class status (Fresher, matusa, masadi, mafosa or mafifi). Define the status as a constant. A student can also do the following; shot and take exam. An employee has an office, salary and date-hired. Provide Constructors for classes to initialize private variables. Override the toString method in each class to display the person's name and address. Write a test class that create one object of type Student and one object of type Employee and print the person's name and the address. [25 Marks]

3. Two Runnables maintain references to a single integer array. Each Runnable writes three 3 values to the array, then terminates. Perform the following task; [25 Marks]
   a) **Task one:** Create a class Buffer that will be shared between two Runnables. Class Buffer should contain an instance variable that holds an array of integers of size 6. Create a method add in the Buffer class that accepts an int value and inserts the value into an array. Ensure that the method add is synchronized. Create another method printArray that prints the contents of the array.
   b) **Task two:** Create a Runnable class BufferWritter that inserts 3 random int values in an array defined in class Buffer. The constructor of BufferWritter must accept an object of type Buffer class
   c) **Task three:** Create a class BufferTest that contains the main method. In the main method, create an object of class Buffer. Create two objects of class BufferWritter and pass the object of Buffer to these two objects so that they both insert int values in the array defined in the Buffer object. Run the two BufferWritter objects as threads. Finally, Call the printArray method on the Buffer object to display the values of an array