



Open University *of* Mauritius

BSc (HONS) COMPUTER SCIENCE [OUbs033]

EXAMINATION FOR: November - December 2022

MODULE : Object Oriented Programming [OUbs033213]

DATE : Tuesday 29 November 2022

DURATION : 2 Hours

INSTRUCTIONS TO CANDIDATES

1. This question paper consists of **FOUR (4) QUESTIONS**.
2. Answer **ALL Questions**.
3. Always start a new question on a fresh page.
4. Total marks: **100**

This question paper contains 4 questions and 5 pages.

ANSWER ALL QUESTIONS

QUESTION 1 [25 MARKS]

a) What is Object Oriented Programming? How does it differ from Procedure Oriented Programming?

(5 marks)

b) Define the following terminologies as used in Object Oriented Programming and provide an example of each:

Instantiation

(2 marks)

Instance Variable

(2 marks)

Method Overriding

(2 marks)

Single Inheritance

(2 marks)

Serialised Object

(2 marks)

c) Write a Java method to receive the Gross Salary of an employee as argument, calculate and return the Tax Payable for an employee. An employee does not pay tax if his monthly Gross Salary is less than 25,000. He pays 10% tax of Gross Salary if he earns 25,000 to 50,000 monthly. He pays 15% tax of Gross Salary if he earns above 50,000. Then, create a Main method to call the above method.

(10 marks)

QUESTION 2 [25 MARKS]

a) Why is an array such an inefficient data structure for a dynamic sorted list?

(3 marks)

b) If linked lists are so much better than arrays, why are arrays used at all?

(3 marks)

c) Complete the following method to print all the elements of a collection using the Iterator interface.

```
void print(Collection c) {  
    // prints all the elements of the collection c  
    // TO COMPLETE  
}
```

(7 marks)

d) Trace the following code, showing the contents of the stack after each invocation:

```
Stack stack = new Stack();  
stack.push(new Character('A'));  
stack.push(new Character('B'));  
stack.push(new Character('C'));  
stack.pop();  
stack.pop();  
stack.push(new Character('D'));  
stack.push(new Character('E'));  
stack.push(new Character('F'));  
stack.pop();  
stack.push(new Character('G'));  
stack.pop();  
stack.pop();  
stack.pop();
```

(12 marks)

QUESTION 3 [25 MARKS]

a) Write a Java program to create a base class *Animal* and declare **two (2)** data members.
(5 marks)

b) Use the class created to demonstrate inheritance. In order to do this, derive a class called *Dog* from class *Animal* and then another class called *Labrador* from class *Dog*.

Give data members, constructor(s) and member functions as necessary.

(15 marks)

c) Use the Main() method to demonstrate object creation, access to data members and invoking member functions.

(5 marks)

QUESTION 4 [25 MARKS]

a) What is an interface?

(3 marks)

b) Give the differences between an interface and a class.

(6 marks)

c) The following figure shows the documentation for the ActionListener interface.

Interface declaration

Following is the declaration for **java.awt.event.ActionListener** interface:

```
public interface ActionListener
    extends EventListener
```

Interface methods

S.N.	Method & Description
1	void actionPerformed(ActionEvent e) Invoked when an action occurs.

Methods inherited

This interface inherits methods from the following interfaces:

- java.awt.EventListener

i. Explain what information the Interface Declaration section is giving.

(3 marks)

ii. Explain what information the Interface Method section is giving and show an example how you would use it.

(3 marks)

d) The program below shows the use of an Interface. Complete the method CompareTo so that the ArrayList is displayed in REVERSED order.

```
class Student implements Comparable<Student>{
    int rollno;
    String name;
    int age;
    Student(int rollno,String name,int age){
        this.rollno=rollno;
        this.name=name;
        this.age=age;
    }

    public int compareTo(Student st){
        // TO COMPLETE
    }

import java.util.*;
public class TestSort{
    public static void main(String args[]){
        ArrayList<Student> al=new ArrayList<Student>();
        al.add(new Student(101,"Vijay",23));
        al.add(new Student(106,"Ajay",27));
        al.add(new Student(105,"Jai",21));

        Collections.sort(al);
        for(Student st:al){
            System.out.println(st.rollno+" "+st.name+" "+st.age);
        }
    }
}
```

(10 marks)