Open University *of* Mauritius

BSc (HONS) COMPUTER SCIENCE [OUbs033]

BSC (HONS) APPLIED ICT WITH SPECIALISATION [OUbs017]

EXAMINATION FOR: June - July 2023

MODULE : Object Oriented Programming [OUbs033213] [OUbs017214]

DATE : Tuesday 27 June 2023

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) List the **four (4)** basic features of OOP.

(4 marks)

b) List **five (5)** advantages that OOP provides

(5 marks)

c) Give **two (2)** differences between a Class and an Object.

(4 marks)

d) Differentiate between public, private and protected access modifiers.

(6 marks)

e) Explain each type of Inheritance mentioned below:

i. Single inheritance

(3 marks)

ii. Multiple inheritance

(3 marks)

QUESTION 2 [25 MARKS]

a) Polymorphism is a concept where objects of different types can be accessed through the same interface. Each type can provide its own independent implementation of this interface. Using the class X below, mention the other name and provide a Java example of:

i. Static polymorphism

ii. Dynamic polymorphism.

```
class X {
        public int sum() {
        // some code
        }
}
```

(5+5 marks)

b) Class SearchEngine, below, provides a search bar in a GUI. The GUI is displayed properly, but clicking the search button does nothing. Your task is to make changes to SearchEngine class so that it will listen for a click of the search button and call method search with the appropriate text if that event occurs.

Information to recall:

- JTextField has a method String getText()
- JButton has a method void addActionListener(ActionListener)
- JButton notifes its action listeners whenever it is clicked and only when it is clicked
- Interface ActionListener has a single method void ActionPerformed(ActionEvent)

```
public class SearchEngine extends JFrame {
        private JTextField searchBar= new JTextField("Enter your search here");
        private JButton submit= new JButton("Search");

        public SearchEngine() {
                Container cp= getContentPane();
                setSize(300, 100);
                setResizable(false);
                cp.add(searchBar, BorderLayout.CENTER);
                cp.add(submit, BorderLayout.WEST);
                setVisible(true);
                pack();
        }

        private void search(String input) { ... }
}
```

(10 marks)

c) For each of the following operations, indicate the worst-case run time for a list of size n. Your answer should be written in Big-O notation.

i. Finding the size of a singly linked list without a size field
ii. Finding the size of a doubly linked list without a size field
iii. Getting the last element of a doubly linked list
iv. Searching for a value in a sorted doubly linked list
v. Getting an element at a particular index of singly linked list

(5 marks)

QUESTION 3 [25 MARKS]

a) Write a Java program to create a base class *Person* 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 *Staff* from class *Person* and then another class called *Admin* from class *Person*. Give **two (2)** additional 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 Exception?

(3 marks)

b) Extend the code shown below to handle the Exception that can occur when opening a file that does not exist. You do not have to add the import that is needed for the exception.

```
public void readFile(String filename) {
File file = new File(filename);
Scanner scan = new Scanner(file);
}
```

(5 marks)

c) What happens if several Catch blocks match the type of the thrown object?

(3 marks)

d) Explain why multithreading is preferred to single thread in a client-server application?

(2 marks)

e) Name the **two (2)** classes that allows multithreading programming in Java.

(2 marks)

f) Every Java thread has a feature that helps the operating system determine the order in which threads are scheduled. Explain how you can change this scheduling order.

(5 marks)

g) Multi-threaded programs may often come to a situation where multiple threads try to access the same resources and finally produce erroneous and unforeseen results. Explain how this can be avoided in Java.

(5 marks)