University of Vavuniya, Sri Lanka

First Examination in Information and Communication Technology - 2020

Second Semester Dec/Jan 2022/2023

TICT1224: Object Oriented Programming (Theorey)

- ⊙ Answer **four questions** only.
- ⊙ This paper has **five questions** on **three pages**.
- ⊙ Time allowed: **Two Hours**.
- ⊙ Start answering question on a new page.

1. (a) What are the advantages of *object oriented programming* over structured programming? [10%]

   (b) State the error(s) of the following code snippet and re-write the correct code. [10%]

```
public class Test{
    int x;
    int y;
    public Test(int x, int y){
        x = x;
        y = y;
    }
}
```

   (c) What is an *iterator*? List out the characteristics of an *iterator*. [14%]

   (d) What is the meaning of the keyword `static` in Java? What are the differences between `static` and `non-static` members. [16%]

   (e) Write Java program to display prime numbers between two intervals. [50%]

2. (a) What is *multilevel inheritance*? [10%]

   (b) Implement the program code for the class `Person` and its sub-class `Employee` and also the sub-category in `Employee` class `Staff`. The attributes and behaviors of the above classes are given below:

      i. The attributes of the `Person` class are name `name(String)`, position `position(String)`, address `address(String)`, and telephone number `telphone(String)`. [20%]

      ii. The attributes of the `Employee` class are office `office(String)`, position `position(String)`, salary `basicSalary(double)`, and date of employment

[Question 2 continues on the next page]

`hireyear(int)` and the behavior of the `Employee` class is bonus `bonus`. The bonus calculation is given below: [40%]

(*Bonus* = *basicsalary* × *servicetime* × *position*)

Employee service time

0 - 1 years	10%
2 - 5 years	12%
5 - 10 years	14%
> 10 years:	16%

Employee position

Lecturer	120%
Senior Lecturer	140%
Professor	160%

iii. The attribute of the `Staff` class is `duty(String)`. [15%]

(c) Implement the program code to display staff name, address, basic salary, and bonus inside the `main` method of `Test` class. [15%]

3. (a) Define the term *abstraction* in the object oriented programming. [10%]

(b) Define the *abstract classes* in Object Oriented Programming. [12%]

(c) Implement the Java program for the following classes:

i. The abstract class `Car`, that contains the constructor `public Car(double originalPrice, int year)` and the abstract method `calculateSalePrice()`. [25%]

ii. The class `ClassicCar`, that contains the constructor `public ClassicCar(double originalPrice, int year)` and the method `calculateSalePrice()`, which returns 10,000 as the sale price of the car. [15%]

iii. The class `SportCar`, that contains the constructor `public SportCar(double originalPrice, int year)` and the method `calculateSalePrice()`, which calculates the sale price of the car as follow:
if year > 2000 then the `salePrice` is 0.75 × its `originalPrice`;
if year > 1995 then the `salePrice` is 0.5 × its `originalPrice`;
otherwise the `salePrice` is 0.25 × its `originalPrice`. [30%]

iv. The class `Test`, that contains the `main` method, which display the sales price for the `ClassicCar` and the `SportsCar`. [08%]

4. (a) What are the advantages of *polymorphism*? [10%]

(b) Give three real-life examples of *polymorphism*. [12%]

(c) Briefly describe the difference between *polymorphism* and *inheritance* in Java? [12%]

(d) Describe the two types of *polymorphism* with java example. - override - overload [30%]

(e) Assume that we have three classes: `Person`, `Teacher`, and `Student`. Teacher and Student are both sub-classes of Person. The object `p, t, and s` are created from three classess: `Person, Teacher, and Student`

```
Person p;
Teacher t;
Student s;
```

State the following assignments that are legal or illegal, and justify why? [36%]

```
t = new Teacher ( );
p = t;
s = (Student) t;
s = (Student) p;
p = new Student ( );
t = new Person ( );
t = p;
```

5. (a) State how data *encapsulation* supports *re usability.* [10%]

   (b) Describe how to achieve *encapsulation* in Java with suitable example. [25%]

   (c) Give three differences between *abstraction* and *encapsulation.* [15%]

   (d) Why is *encapsulation* called as *data hiding*? [10%]

   (e) Briefly describe the differences between `private`, `default`, `protected`, and `public` access modifiers? [28%]

   (f) What are the two parts of Java packages? and explain them. [12%]

End