00732

The Open University of Sri Lanka
Faculty of Engineering Technology
Department of Electrical & Computer Engineering

Study Programme	: Bachelor of Software Engineering Honours
Name of the Examination	: Final Examination
Course Code and Title	**: EEI3262 Introduction to Object Oriented Programming**
Academic Year	: 2022/23
Date	: 27th October 2023
Time	: 0930-1230hrs
Duration	: **3 hours**

General Instructions

1. Read all instructions carefully before answering the questions.
2. This question paper consists of **Four (04)** questions in **Three (03)** pages.
3. Answer all questions.
4. Answer for each question should commence from a new page.
5. This is a Closed Book Test **(CBT).**
7. Answers should be in clear handwriting.
8. Do not use red colour pen or pencil.

Q1 [40 Marks]

You are supposed to develop a University Management System (UMS) using Java programming language. The system involves different types of users such as students, academic and non-academic members. Each user has a name, NIC, and e-mail address. The students have additional properties such as degree program and year, while academic members have additional properties such as department and taught course, and non-academic members have additional properties such as job title and work hours. The system allows students to view their final exam results for each course, academic members to add the course they teach, and non-academic members to enter final exam results for each student. As a Software Architect of the UMS project, answer the questions given below.

a) Briefly explain the below mentioned terms in Object Oriented Programming.
   i) Class
   ii) Object
   iii) Encapsulation
   iv) Inheritance [08 Marks]

b) Identify the list below from the UMS.
   i) Subclasses in UMS.
   ii) All the attributes of all subclasses.
   iii) Methods that can be created in each class. [12 Marks]

c) Below mentioned Java code was written by one of the developer. The Java code of the 'User' class has created based on the UMS project.

```
abstract class User {
    String name;
    String NIC;
    String email;
}
```

   i) Is using abstract keyword correct here? Justify your answer. [05 Marks]
   ii) Modify and re-write the above Java class with *encapsulation*. [15 Marks]

Q2 [20 Marks]

a) Define the term 'Programming Paradigm'. [02 Marks]

b) Consider the following set of words. Categorize them as either 'class' or 'object'.
(Human, Vehicle, Banana, iPhone 15, Parrot) [05 Marks]

c) Using a diagram, describe all the steps involved from writing to running a Java source code on a computer. Differentiate the steps in compile time and run time. [13 Marks]

Q3 [20 Marks]

a) Write a Java method to add any two given whole numbers and return the result. Include all the elements that can be included in an *instance* method signature. Then name all the elements in the method signature. [10 Marks]

b) This is an abstract Java class created for a 'LibraryItem' in a library system.

```
public abstract class LibraryItem {

    public int checkoutDuration() {
        return 0;
    }
}
```

The library has different types of items such as books, magazines, and DVDs. All items can be checked out, but the checkout duration varies based on the type of item. Books can be checked out for 21 days, magazines for 7 days, and DVDs for 2 days. Also, some items like books can have extended checkout durations for members with premium memberships.

Subclasses Book, Magazine, and DVD extend the 'LibraryItem' class.

Fill the blanks for the 'checkoutDuration' method of the subclass 'DVD' given below. The 'checkoutDuration' method was created based on method *overriding* technique in *polymorphism*. (Write your answers in the answer sheet)

```
public (i)..... checkoutDuration() {

        return (ii).....;

}
```

Fill the blanks for the 'checkoutDuration' method of the subclass 'Book' given below. The 'checkoutDuration' method was created based on method *overloading* technique in *polymorphism*. The *overloaded* method should take one parameter that specifies whether the member of the library is a premium member or not. (Write your answers in the answer sheet)

```
public int checkoutDuration( (iii)..... isPremiumMember ) {

        if ( (iv)..... ) {
            return 28;
        } (v)..... {
            return checkoutDuration();
        }
}
```

[10 Marks]

Q4 [20 Marks]

a) List down the differences between an 'interface' and an 'abstract class' in Java. [08 Marks]

b) Answer the questions given below, considering the code snippet.

```
class Person{

      String name;
      int age;
      String country;
      String province;
      String street;
      int postalCode;
      String city;

      public String getFullAddress(){
            return street+province+postalCode+city+country;
      }
}
```

i) What is the refactoring technique that can be used to refactor the above mentioned code?
ii) Write the potential name for the new class that will be created after refactoring?
iii) Name the variables that will be moved to the new class after refactoring.
[09 Marks]

c) List down the three types of Programming Errors. [03 Marks]

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