

University of Chittagong
Department of Computer Science and Engineering
3rd Semester B.Sc. (Engg) Examination-2022
Course Code: CSE-311 Course Title: Object Oriented Programming Language
Total marks: 54 Marks Time: 4.00 hours

[Answer any **three** questions from each of the **Section-A** and **Section-B**; a Separate answer script must be used for Section-A and Section-B. Figures in the right-hand margin indicate full marks]

Section-A

- 1.a) Consider the following segment of Java code to explain the three important features of object-oriented programming (OOP). You can add additional code segments to support your explanation. 4
- ```
class Circle {
 double radius;
 Circle(double r) {
 radius = r;
 }
 double area() {
 return 3.14 * radius * radius;
 }
}
```
- b) Give concise description of polymorphism, encapsulation, and inheritance. 3
- c) Why we use namespace during Java coding. 2
2. a) Create abstract class ABC with abstract methods estimateSweetPrice( ), estimateSnacksPrice( ) and VAT( ) as non-abstract method. Create a child class called DEF that extends ABC and a class GHI that extends DEF. Override the abstract methods. Show the usage of super and final keywords. Write the appropriate main method and the expected output. 3.5
- b) Consider the following code segment 3
- ```
class Sample {  
    public static void main(String args[])  
    {  
        Display obj = new Display();  
        obj.disp('a');  
        obj.disp('a',10);  
        obj.disp('a',10, 5.5);  
    }  
}
```
- Now, write the Java class *Display*. Also, mention the name of the Java feature/technique you have used to complete the code. Write down its benefits
- c) What is the significance of *.class file in Java? Write a Java program to explain the local, instance, and class variables. 2.5

3. a) Consider the following FruitShop class. Now, write a class Fruit in such a way that the FruitShop class will give the expected output as shown below. 3

```
public class FruitShop {
    public static void main(String[ ] args) {
        Fruit fruit1 = new Fruit("Apple", 3.5, 110);
        Fruit fruit2 = new Fruit("Mango", 5, 90);
        fruit1.reducePricePerKG(10);
        fruit2.increasePricePerKG(20);
        fruit1.printDetails();
        fruit2.printDetails();
    }
}
```

```
Fruit Details:
Name: Apple
Weight: 3.5kg
Price per kg: 100.0
Total price: 350.0

Fruit Details:
Name: Mango
Weight: 5.0kg
Price per kg: 110.0
Total price: 550.0
```

- b) Find and fix the errors in the given code snippet. For each error, point out the error, explain why it is an error and write down a possible way to fix it. You can edit any line of code but you are not allowed to delete any line of code. 3

```
class A {
    public static final int var;
    public int par;
    static {
        var = 10; par = 5;
        System.out.println("Static block in A");
    }
    void meth( ){
        var = 15;
        System.out.println("Method in class A");
    }
}
class B extends A {
    final void meth( ){
        var += 20;
        System.out.println("Method in class B");
    }
}
```

```
final class C extends B {
    int star;
    void meth( ){
        System.out.println("Method in class C");
    }

    public static void main(String[ ] args) {
        B obj1 = new B( );
        B obj2 = new B( );
        obj1.meth( );
        star = 100;
        System.out.println("par = " + obj1.par +
            ", var = " + obj2.var +
            ", star = " + star);
    }
}
```

- c) What is probably wrong with the following code? Explain briefly. 1

```
package p1;

public class Test3 {
    int addTwoNumbers(int a, int b) {
        return a + b;
    }
}
```

```
package p2;
import p1.*;
public class Test1 {
    public static void main(String args[]){
        Test3 obj = new Test3();
        obj.addTwoNumbers(10, 21);
    }
}
```

d) Write the output of the following code.

2

```
public class Animal {
    Animal()
    {
        System.out.println("Animal created");
    }
    void eat()
    {
        System.out.println("Animal eats");
    }
    void fly()
    {
        System.out.println("Animal fly");
    }
}

public class Bird extends Animal{
    Bird()
    {
        System.out.println("Bird created");
    }
    void fly()
    {
        System.out.println("Birds fly");
    }
    public static void main(String[] args)
    {
        Animal a= new Bird();
        a.fly();
        a.eat();
    }
}
```

4. a) Demonstrate the concept of hierarchical inheritance to estimate the value of the following equation.

3

$$m = \sqrt{\sqrt{\frac{\sqrt{\frac{24t}{2}}}{\sqrt{xt} + 100}}}$$

b) Write a program that shows the use of multiple inheritance mechanism using the interface.

3

c) Is it a must for abstract classes to have abstract method/methods?

1

d) Can you have two return statements in a method? Can you write any statement after return? Explain with necessary code segments.

2

Section-B

5. a) Identify the type of Exception in the given code. Use appropriate catch block(s) to handle it.

3

```
public class MyException {
    public static void main(String[] args) {
        int a[]=new int[5];
        a[5]=10;
        Integer.parseInt("abc");
        Scanner scan=new Scanner(System.in);
        int x=scan.nextInt();
    }
}
```

b) Write the output of the following code.

2

```
public class Main {
    static String str = "a";
    public static void main(String[] args){
        try{
            str += "b";
            System.out.println(str);
            throw new Exception("Whatever");
        }
        catch (Exception e){str += "c"; }
        finally{
            str += "d";
            System.out.println(str);
            str += "e";
        }
        System.out.println(str);
    }
}
```

c) Observe the code below, the sample run/output and create the Exception Class mentioned in the code; *LowBatteryException*, so that the program produces the following outputs.

3

```
import java.util.Scanner;
public class MyException{
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);

        for(int i = 0; i < 2; i++) {
            System.out.print("Enter current charge percent: ");
            int chargeAmount = sc.nextInt();
            try {
                if (chargeAmount <= 20)
                    throw new LowBatteryException(chargeAmount);

                else
                    System.out.println("Enough charge in battery.");
            } catch (LowBatteryException e) {
                System.out.println(e.getMessage());
            }
        }
    }
}
```

Sample run/output

Enter current charge percent: **25**

Enough charge in battery.

Enter current charge percent: **16**

Battery is low! Should be above 20.

Current value: 16

d) Write the differences between Multithreading and Multiprocessing in one point.

1

6. a) With Java threads, it is very easy to parallelize computations. Suppose you are in a job interview and the interviewer asks you to write a Java code to find out the summation of 1 to 100000. You can't use any simple equation; you can only use loops. But you are asked to divide the work equally among 5 different threads. Write complete Java code to compute the summation of 1 to 100000 by dividing the work equally among 5 different threads. The main thread will wait for the 5 threads to finish and will only print the final summation. 4

- b) Write the output of the following program. 3

<pre> public class MyThread extends Thread{ MyThread() { System.out.print("MyThread"); } public void run() { for(int i = 0; i < 4; i++) { System.out.println(" running"); try {sleep(1000);} catch (InterruptedException e) {} } } public void run(String s) { System.out.print(s + " is running again"); } } </pre>	<pre> public class Application { public static void main (String [] args) { Thread t = new MyThread() { public void run() { System.out.println(" are you running?"); } }; ((MyThread)t).run("MyThread"); t.start(); } } </pre>
---	---

- c) Suppose, in your Java program you need to create a thread A, but A needs to extend class B. Write some code to show how you can create the thread. 2

7. a) You are given a text file named “numbers.txt” which contains some numbers in each line that are separated with commas. Write a Java program to read the file and for each line print the sum of the numbers in the console. A sample input and output are provided below: 3

<u>input.txt:</u>	<u>console:</u>
10,11,12	33
1,18	19
2,13	15
33,22,1,1	57
1	1

- b) The following table contains data of books in the form of IDs (keys) and titles (values). By using which data structure from the Java Collections framework, adding and searching books by ID will be most efficient? Why so? Write your solution code. 3

ID (key)	Title (value)
101	Structured Programming
102	Algorithms
103	Operating Systems

- c) Suppose you have a file named “data.txt”. The contents of the file data.txt is given below: 3

data.txt									
1	19.5	8	77	25	27.4	3.99	89	5.35	80

Now, answer the following questions:

- i) Create an ArrayList that is filled up by reading the values from the data.txt file (your ArrayList should have 10 elements).
- ii) Create a second ArrayList that contains the values of the first ArrayList but in reversed order (the first and last element of the second ArrayList will be 80 and 1).
- iii) Write the contents of the second ArrayList in another file named “reversed.txt”.

8. a) Explain why the protected category is needed. 2
- b) What happens when a protected member is inherited as a public? What happens when it is inherited as private? 3
- c) Write a Java program that creates a class called card that maintains a library card catalog entry. Use a public member function called store() to store a book's information like author's name, edition of a book. In addition, create another public member function called show() to display the above mentioned information. Include a short main() function to demonstrate the class. Apply the concept of inheritance in this program. 4