



University of Kelaniya – Sri Lanka
Centre for Distance & Continuing Education
Bachelor of Science (General) External
Second Year First Semester Examination – 2019
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Faculty of Science

Computer Studies
COST 26553 (R) – Object Oriented Programming

No. of Questions: **Four (04)**

No. of Pages: **Four (04)**

Time: **Two and half (02 ½) hrs.**

Answer **ALL** questions.

1.

- (a) List three (03) principles of Object-Oriented Programming (OOP) and briefly explain each.
- (b) “Java is a platform-independent programming language.” Explain this statement with appropriate reasoning.
- (c) Briefly explain the following Java components:
 - (i) Java virtual machine (JVM)
 - (ii) Java Development Kit (JDK)
- (d) Write Java code segments for the followings:
 - (i) Write a code segment to count and print the number of even and odd numbers in the array
`int[] numbers = {10, 5, 3, 8, 2, 7};`
 - (ii) Write a code segment to extract and print the last name from a full name input.

Ex: Full name: Pasan Dileepa Dissanayake → Last name: Dissanayake

- (e) Give the output of the following code segment when it is executed.

```
public static void main(String[] args) {  
    int a = 1;  
    for (int i = 1; i <= 4; i++) {  
        for (int j = 1; j <= i; j++) {  
            System.out.print(a++ + " ");  
        }  
        System.out.println();  
    }  
}
```

2.

- (a) What is the difference between instance variables and static variables?
- (b) "Java Strings are immutable". Elaborate this statement.
- (c) StringBuilder and StringBuffer classes are used to create mutable Strings. But StringBuilder is faster than StringBuffer. Why?
- (d) Give two (02) advantages and two (02) disadvantages of Java arrays.
- (e) Consider the following code.

```
1. class Student {
2.     private String name;
3.     private int age;
4.
5.     Student(String n, int a) {
6.         name = n;
7.         age = a;
8.     }
9.
10.    void printInfo() {
11.        System.out.println("Name: " + name);
12.        System.out.println("Age: " + age);
13.    }
14.
15.    public static void main(String[] args) {
16.        Student s = new Student();
17.        s.printInfo();
18.    }
19. }
```

- (i) Identify the compilation error(s) and specify the line number(s) with the problem(s). Provide a reason for each error.
- (ii) Write the corrected version of the code.
- (iii) What will be the output of the corrected code if the name is "Kavindi" and the age is 21?

3.

- (a) What is the difference between a default constructor and a parameterized constructor in Java? Give an example of each.
- (b) List two (02) purposes or benefits of using packages in large-scale Java applications.
- (c) Briefly explain three (03) different types of access modifiers in Java.
- (d) Indicate whether there will be an error or not in below cases. If there is an error, give the reason as well.
 - (i) A class defines a constructor with protected access. We are trying to create an object of that class from a subclass located in a different package.

- (ii) Class B is public and it is located in package one. We are trying to create new objects of type B inside class C which is located in package two.
 - (iii) We declare two public classes (A and B) in a single .java file.
- (e) Consider the following details about the Point class and Line class to complete the code.
- (i) Write a class called Point which has two private fields to store x and y coordinates of a point. This class should include the following:
 - public Point(int a, int b) :** Constructs a new point that contains the given coordinates.
 - public String toString() :** Returns a String representation of a point such as (10, 3).
 - (ii) Write another class called Line that represents a line segment between two points. Line objects should have the following methods:
 - public Line(Point p1, Point p2) :** Constructs a new Line that contains the given two points.
 - public Point getP1() :** Returns this Line's first endpoint.
 - public Point getP2() :** Returns this Line's second endpoint.
 - public String toString() :** Returns a String representation of this Line, such as [(22, 3) , (4, 7)]
 - public double getSlope() :** Returns the slope of this Line. The slope of a line between points (x1 , y1) and (x2 , y2) is equal to $(y2 - y1) / (x2 - x1)$.
 - (iii) Write a client class named LineClient. It should create an object of class Line and initialize it with points (22, 3) and (4, 7). Print the line object. Print out the slope of the line.

4.

- (a) Define method overloading and method overriding.
- (b) What is the role of polymorphism in object-oriented systems?
- (c) What is the key benefit of inheritance?
- (d) Compare and Contrast Abstract Classes and Interfaces.
- (e) A university has a Vehicle Management System. Different types of vehicles are managed, including Bicycles, Motorbikes, Cars, and Buses. Some vehicles are electric, and others are fuel-powered. All vehicles have license numbers and owners, and they can be booked by staff or students.
 - (i) Identify the Objects in this system.

- (ii) Draw a Class Inheritance Hierarchy Diagram to reflect the above relations.
- (iii) Identify the Attributes and Methods for the following classes: Vehicle, ElectricVehicle, Car, and Bus.
- (iv) Write the Java syntax to make the ElectricVehicle class an abstract class and define one abstract method calculateChargeTime().

***** End of the Question Paper *****