Java Programming Exam

Total Marks: 50

Duration: 2 Hours

Part A: Multiple-Choice Questions (30 Marks)

Instructions:

- Answer all questions.
- Each correct answer is awarded specific marks (3 for easy, 4 for moderate, 5 for hard).

Easy Questions (9 Marks)

1. **What is the default value of a boolean variable in Java?**
   A) true
   B) false
   C) null
   D) 0

2. **Which of the following is a valid way to declare a method in Java that does not return any value?**
   A) public void myMethod() {}
   B) public return void myMethod() {}
   C) public void return myMethod() {}
   D) void public myMethod() {}

3. **Which of the following is NOT a valid primitive data type in Java?**
   A) int
   B) double
   C) string
   D) char

Moderate Questions (12 Marks)

4. **Which of the following methods can be used to read input from the user in Java?**
   A) Scanner.nextInt()
   B) Scanner.next()
   C) BufferedReader.readLine()
   D) All of the above

5. **Which of the following is true about method overloading in Java?**
   A) It allows two methods with the same name to have different return types.
   B) It allows two methods with the same name and parameters.
   C) It allows two methods with the same name but different parameter types.
   D) It allows two methods with the same name but different access modifiers.

6. **What will be the output of the following code?**

int a = 10;

int b = 5;

System.out.println(a / b);

A) 2.0
B) 2
C) 10
D) 0

Hard Questions (9 Marks)

7. **Which of the following statements about the HashMap class in Java is true?**
   A) It allows duplicate keys.
   B) It maintains the order of keys in the map.
   C) It allows only one null key.
   D) It is synchronized by default.

8. **In Java, what is the purpose of the volatile keyword?**
   A) To ensure that a variable can only be modified by one thread at a time.
   B) To guarantee that the value of a variable is always updated in all threads.
   C) To prevent the value of a variable from being cached.
   D) To ensure that a variable cannot be assigned a null value.

9. **What is the time complexity of accessing an element from a HashMap in the average case?**
   A) O(n)
   B) O(log n)
   C) O(1)
   D) $O(n^2)$

Part B: Programming Questions (20 Marks)

Instructions:

- Answer all programming questions.
- You are required to write code solutions for the given problems.
- Each code question carries specific marks.

Question 1: Sum of First 100 Integers (10 Marks)

Write a Java program to find the sum of the first 100 integers using a loop. The output should display the sum of integers from 1 to 100.

Question 2: Basic Calculator (10 Marks)

Write a Java program that implements a basic calculator. The calculator should perform the following operations:

- Addition
- Subtraction

- Multiplication
- Division

The program should ask the user to input two numbers and an operation (either +, -, *, or /). The program should display the result of the operation. If division by zero is attempted, display an error message.

End of Paper

Marking Scheme:

Part A: Multiple-Choice Questions (30 Marks)

- **Easy Questions (9 Marks)**: 3 questions × 3 marks = **9 Marks**
- **Moderate Questions (12 Marks)**: 3 questions × 4 marks = **12 Marks**
- **Hard Questions (9 Marks)**: 3 questions × 5 marks = **9 Marks**

Part B: Programming Questions (20 Marks)

- **Question 1 (Sum of First 100 Integers)**: 10 Marks
- **Question 2 (Basic Calculator)**: 10 Marks

Total Marks: 50

General Instructions:

1. You are not allowed to use any external help like the internet, books, or other people during the exam.
2. Make sure your code is properly indented and follows standard Java conventions.
3. Write your answers legibly. In case you are solving any problem on paper, ensure it is easy to read.
4. If you are unsure of an answer, try to attempt it with your best guess.

Part A: Multiple-Choice Questions (30 Marks)

Easy Questions (9 Marks)

1. **What is the default value of a boolean variable in Java?**
   Answer: B) false
2. **Which of the following is a valid way to declare a method in Java that does not return any value?**
   Answer: A) public void myMethod() {}
3. **Which of the following is NOT a valid primitive data type in Java?**
   Answer: C) string

Moderate Questions (12 Marks)

4. **Which of the following methods can be used to read input from the user in Java?**
   Answer: D) All of the above
   Explanation: You can use `Scanner.nextInt()`, `Scanner.next()`, and `BufferedReader.readLine()` to read input from the user in Java.
5. **Which of the following is true about method overloading in Java?**
   Answer: C) It allows two methods with the same name but different parameter types.
6. **What will be the output of the following code?**

Answer: B) 2
***Explanation*: The code performs integer division, so `10 / 5` equals `2`.**

Hard Questions (9 Marks)

7. **Which of the following statements about the HashMap class in Java is true?**
   Answer: C) It allows only one null key.
8. **In Java, what is the purpose of the volatile keyword?**
   Answer: B) To guarantee that the value of a variable is always updated in all threads.
   Explanation: The `volatile` keyword ensures that any thread reading a variable gets the most up-to-date value, rather than using a cached value.
9. **What is the time complexity of accessing an element from a HashMap in the average case?**
   Answer: C) O(1)
   Explanation: HashMap provides constant-time (O(1)) access in the average case due to the hash function.

Part B: Programming Questions (20 Marks)

Question 1: Sum of First 100 Integers (10 Marks)

```
public class SumOfFirst100Integers {

    public static void main(String[] args) {
```

```
        int sum = 0;

        for (int i = 1; i <= 100; i++) {
            sum += i;
        }

        System.out.println("The sum of the first 100 integers is: " + sum);
    }
}
```

Question 2: Basic Calculator (10 Marks)

```
import java.util.Scanner;

public class BasicCalculator {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);

        System.out.println("Enter first number: ");
        double num1 = scanner.nextDouble();

        System.out.println("Enter second number: ");
        double num2 = scanner.nextDouble();

        System.out.println("Choose an operation (+, -, *, /): ");
        char operation = scanner.next().charAt(0);

        double result = 0;
        boolean validOperation = true;

        switch (operation) {
            case '+':
                result = num1 + num2;
                break;
```

```
            case '-':
                result = num1 - num2;
                break;
            case '*':
                result = num1 * num2;
                break;
            case '/':
                if (num2 != 0) {
                    result = num1 / num2;
                } else {
                    System.out.println("Error: Division by zero is not allowed.");
                    validOperation = false;
                }
                break;
            default:
                System.out.println("Invalid operation!");
                validOperation = false;
        }

        if (validOperation) {
            System.out.println("The result is: " + result);
        }

        scanner.close();
    }
}
```

Summary of Marks:

- **Part A** (Multiple-Choice Questions): 30 Marks
    - Easy Questions: 9 Marks
    - Moderate Questions: 12 Marks
    - Hard Questions: 9 Marks

- **Part B** (Programming Questions): 20 Marks
    - Sum of First 100 Integers: 10 Marks
    - Basic Calculator: 10 Marks

Total Marks: 50

Final Remarks:

- The **Multiple-Choice Questions** cover fundamental Java concepts such as data types, control structures, and libraries.
- The **Programming Questions** assess the ability to solve problems using Java and demonstrate understanding of loops, user input, and conditional statements.